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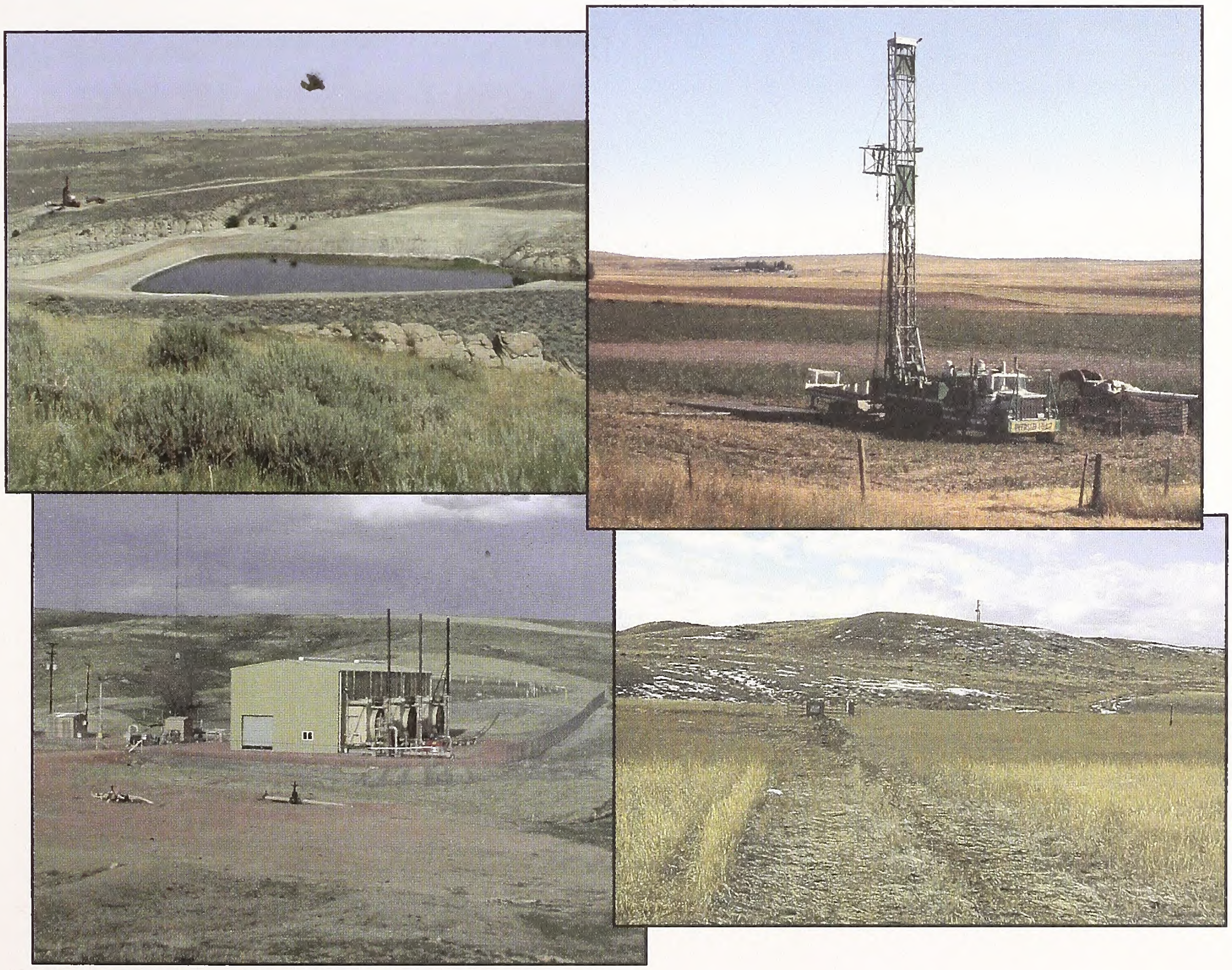
Buffalo Field Office
January 2003

Final Environmental Impact Statement and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project

Volume 3 of 4

(WY–070–02–065)



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Appendix A
Reasonably Foreseeable Development Scenario

REASONABLY FORESEEABLE DEVELOPMENT SCENARIO FOR OIL AND GAS DEVELOPMENT IN THE BUFFALO FIELD OFFICE AREA, CAMPBELL, JOHNSON, AND SHERIDAN COUNTIES, WYOMING

Prepared by:

Wyoming State Office - Reservoir Management Group

Released: February 2001

REASONABLY FORESEEABLE DEVELOPMENT SCENARIO FOR OIL AND GAS DEVELOPMENT IN THE BUFFALO FIELD OFFICE AREA, WYOMING

SUMMARY

Estimating how much oil and gas activity will occur on federal acreage in the Buffalo Field Office Area (BFOA) during the next ten years is at best difficult. It is expected that, with a few exceptions, all public domain and acquired minerals will be available for leasing as indicated by the current land use plan. Review of oil and gas price, occurrence potential, play analysis, and leasing, seismic, drilling, and production activities was needed to understand the oil and gas resource potential. This information was used to project activity through 2010. Where appropriate, the coalbed methane (CBM) resource is discussed separately from conventional oil and gas.

The BFOA is in northeast Wyoming (Figure 1) and most of it lies in the Powder River Basin. Fifteen oil and gas plays have been identified and are summarized by the U.S. Geological Survey (Dolton 1990). An oil and/or gas play is an area, geologic formation, or geologic trend which has good potential for oil and/or gas development or is generating a large amount of interest in leasing and drilling.

The CBM play covers the central part of the BFOA and is currently one of the most active gas plays in the country. Ninety eight percent of the CBM resources are in Campbell, Johnson, and Sheridan counties, Wyoming. Converse and Natrona counties contain the remaining two percent. Montana contains about two percent of the total estimated CBM resources in the Powder River Basin, excluding native lands.

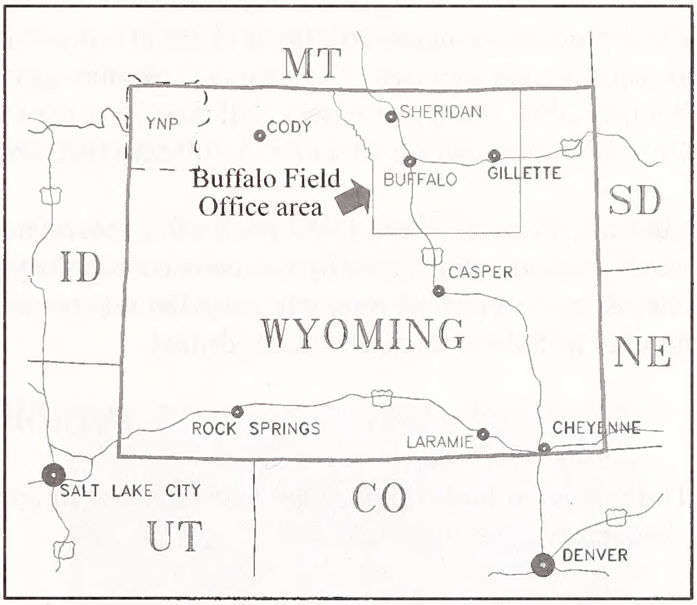


Figure 1 Index map showing location of the Buffalo Field Office area.

Federal oil and gas leasing through 2010 will average between 100,000 and 500,000 acres per year. Average bids are expected to be between $10 to $50 per acre. From February 1990 to August 1999, the BLM received $83 million in oil and gas lease bonuses for the BFOA. About $51 million of that total is estimated to be directly attributed to CBM interest.

Seismic activity on BLM administered surface will average 15 surveys per year through 2010. Most will be three dimensional surveys rather than the two dimensional surveys common in the past. Most seismic activity will continue to occur in Campbell County.

Through 2010, non CBM federal wells are expected to be drilled at an average of 30 to 150 per year, but, could be as high as 200 per year. New non CBM field discoveries will average five to ten per year, with average field size being two to five wells.

Future CBM drilling was estimated, using 28 trillion cubic feet of gas as the recoverable reserve. This is the high estimate, but was used so that the largest potential impact could be assessed. Three reasonably foreseeable development scenarios for CBM, were calculated based on different average well recoveries. The moderate scenario projects 81,000 total CBM wells in Wyoming, with 50,000 wells drilled by 2010. The high scenario projects 139,000 total wells, with 80,000 being drilled by 2010.

BFOA oil production in 1998 was 17 million barrels. Although oil production may show minor year-to-year increases, overall it is anticipated to decline about five percent per year over the period reviewed. This projection could change if a major oil play develops or prices increase substantially and stabilize. Oil production from federal leases will continue to be about 50% of total oil production.

Non CBM gas production declined from 3.4 billion cubic feet of gas (BCFG)/month in January 1986 to 1.3 BCFG/month in January 1999. Although there may be year-to-year increases, the decline in non CBM gas production is expected to continue through 2010.

CBM production increased from 0.28 BCFG/month in January 1995 to 4.57 BCFG/month in June 1999, an average annual increase of 62 percent. Annual gas production rates are expected to continue to increase through 2005. Production rates will then level off for a few years before starting to decline. During June 1999 14 million barrels of water (1,800 acre feet) were produced.

Currently there are about 1,282 productive federal non-CBM oil and gas wells in the BFOA. Although the number of producing oil wells may increase slightly year-to-year it will almost certainly decline over the next ten years. During the next ten years the number of federal non CBM wells abandoned will exceed the number of federal non CBM wells drilled.

INTRODUCTION

The following scenario presents an estimate of future activity within the BFOA, under the current land use plan, unless otherwise noted.

It was assumed that all public domain and acquired minerals would be available for leasing and development without excessive restrictions, except for:

- wilderness and wilderness study areas (only the Fortification Creek Wilderness Study Area, 12,419 acres mostly in T. 52 N., R. 72 W., has high oil and gas occurrence potential);
- selected areas within federally approved coal mine plans; and
- Wyoming Game and Fish big game winter ranges adjacent to the Bighorn National Forest.

Impacts caused by oil and gas development, and impacts to oil and gas development cannot be assessed without estimating future oil and gas activity. Estimates of future activity need to take into account:

- crude oil and natural gas prices and anticipated price changes;
- oil and gas occurrence potential;

- oil and gas play analysis (including looking at the potential development of new plays such as horizontal drilling in the Niobrara Formation or CBM development) or renewed interest in old plays;
- leasing;
- seismic surveys, including advances in three-dimensional analysis;
- drilling; and
- production, including advances in, and application of technology, such as secondary and enhanced oil recovery.

The above factors cannot be predicted with certainty, but some generalizations are possible. The estimates presented here are based on past activity and trends and anticipated future price increases. Those estimates may be lower than what actually happens if price and play developments are more positive than anticipated. Likewise, if exploration in existing plays is disappointing, new plays are not developed, and/or commodity prices are less than anticipated, these estimates may be optimistic.

OIL AND GAS PRICES

The annual change in oil price for the lower 48 states was estimated to range between -1.3 and +1.5 percent for the 1999-2020 period (Energy Information Administration 1998), with a best guess increase of 0.4 percent per year (Figure 2). The actual increase in oil price the past few years has been much higher than predicted. Wyoming sweet crude prices, as reported by Conoco, Inc., were $8.13 in December of 1998 and increased to $24.89 in December of 2000. Average U.S. petroleum consumption is estimated to increase 18 to 46 percent during 1999-2020 (Energy Information Agency 1998).

The average annual change in gas price was projected to be between -0.7 and +1.2 percent during 1999-2020, with a best guess increase of 0.5 percent (Energy Information Administration 1998). Figure 3 shows this projection. The actual increase in gas price the past few years has been much higher than predicted. Opal sweet gas spot prices, as reported by the Oil and Gas Journal, were $2.00 in December of 1998 and increased to $6.00 in December of 2000.

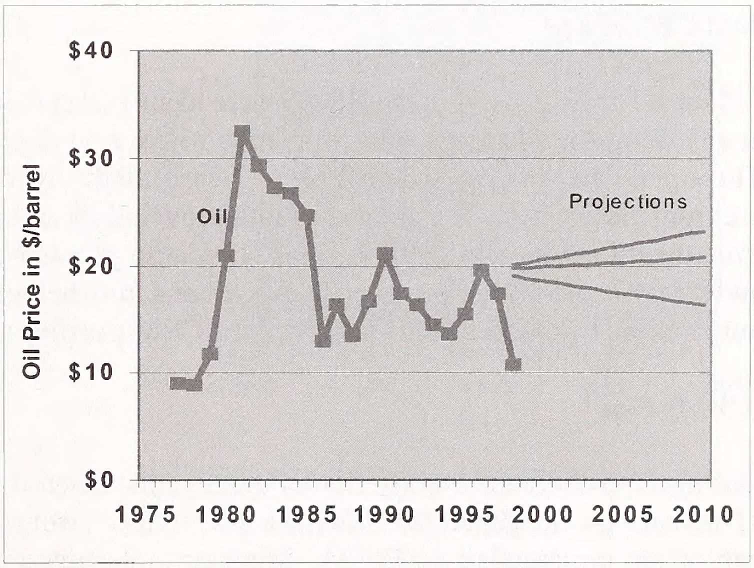


Figure 2 Historic oil prices (Wyoming State Geological Survey 1996) and projections (Energy Information Administration 1998).

OIL AND GAS OCCURRENCE POTENTIAL

Projection of future oil and gas activity must first consider where those resources might occur. To do this an occurrence potential map was constructed (Map 1). The oil and gas occurrence potential was classified as High, Moderate, Low, or None. Explanation of these classifications is given on the map. Note that most of the BFOA has high occurrence potential. The classification is based on geology, data from oil and gas test wells, and the play areas described by Dolton, et al (1990). The Geologic Map of Wyoming (Love and Christiansen 1985) and the Structure Contour Map of the Powder River Basin and Casper Arch, Wyoming and Montana (Petroleum Information 1987) were also used. Map 1 does not indicate whether these resources can be developed economically.

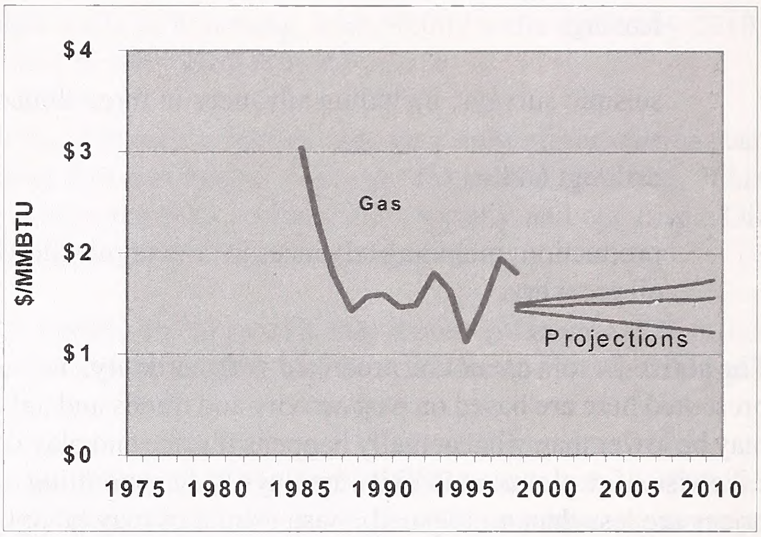


Figure 3 Historic gas prices (Wyoming State Geological Survey 1996) and projections (Energy Information Administration 1998).

OIL AND GAS PLAYS

Non CBM Plays

Fifteen oil and gas plays in the BFOA were identified and described by the U.S. Geological Survey (Dolton, et al 1990). An oil and gas play is an area where a geologic formation can contain oil and/or gas deposits. These plays are summarized in Table 1. Nearly all the hydrocarbons produced from fields within the BFOA are from these plays. The amount of undiscovered oil and gas remaining in the BFOA cannot be estimated from the information in Table 1. This is because geologic heterogeneity, uneven distribution of resources, and reservoir size variations keep hydrocarbons from being evenly distributed across a play area. Two plays not reported by Dolton, et al (1990) are the CBM gas play and the Niobrara Formation fractured shale play.

(CBM) Play

During deposition and compaction of the organic material which ultimately becomes coal, large quantities of methane gas are generated. Methane gas produced from coal has a lower energy (BTU) content than other natural gas produced in the BFOA. Methane molecules are trapped by adsorption in the coal micro pores, and porosity.

The BFOA contains some of the largest coal deposits in the country. The most extensive coal beds are in the Paleocene age Tongue River member of the Fort Union Formation.

The approximate area of potential CBM development can be defined based on depth to coal and coal thickness (Map 2). The play was one of the most active gas plays in the country for 1998-2000. Initially, wells were less than 500 feet deep and were concentrated just west of coal mines on the plays east side. Over time, well depths have increased and growth of the play has extended to the west. Many new wells are more than 1,000 feet deep. To develop the deepest coals in the Tongue River member, wells may need to be drilled as deep as 3,000 feet.

In October 1999 there were over 1,230 producing and 900 shut-in wells in the play. Figure 4 shows CBM production from the BFOA. Production for October 1999 was 5.8 BCFG. The BFOA experienced a production increase that averaged 62% per year for the period October 1994-October 1999. Lack of pipeline capacity limited production until late 1999 when two new lines were completed into the Powder River Basin. Based on Wyoming Oil and Gas Conservation Commission data, cumulative CBM production through October 1999 was 110 BCFG.

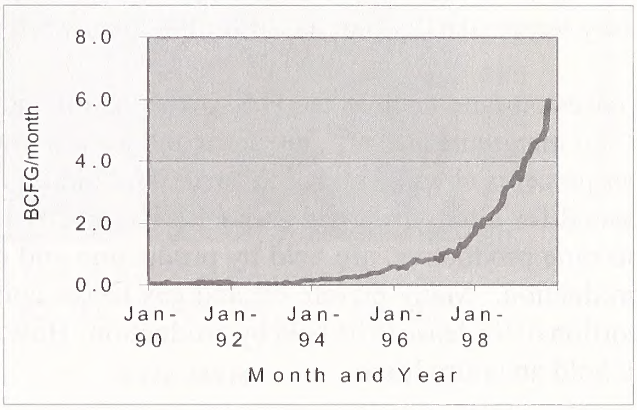


Figure 4 CBM production for BFOA.

CBM resource estimates (Potential Gas Committee 1998) for the Powder River Basin range from 4,664 to 15,859 BCFG with a best guess of 9,329 BCFG. The U.S. Geological Survey also estimated the CBM resources in the Powder River Basin, but their estimate is several years old and was made before the play began rapid and extensive expansion. Their estimates appear to be too low and were not used in this analysis.

Figure 5 displays the drilling history in the BFOA for 1990-1998. There was a general decline in the number of wells drilled through 1994, with most wells drilling in the Minnelusa play. After 1994, total wells increase due to CBM drilling. Most wells listed as "others" on Figure 5 were drilled in the Shannon or Sussex sandstones.

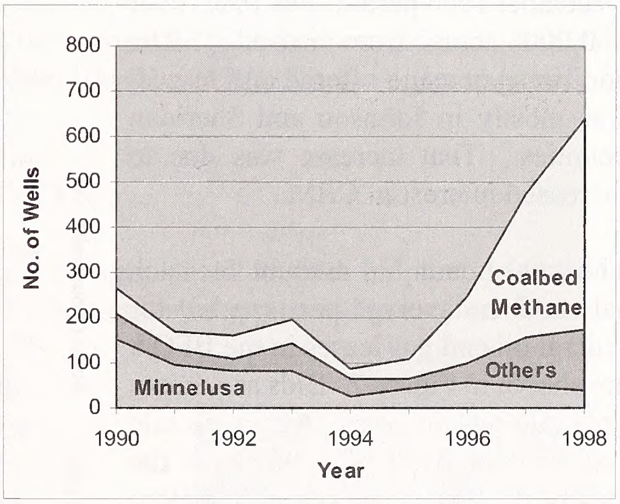


Figure 5 Wells drilled in the BFOA during 1990-1998. Data are from PI/Dwights.

Niobrara Formation Fractured Shale Play Economic development of the Niobrara Formation fractured shale play will almost certainly depend upon successful application of horizontal well technology. This play is currently in it's infancy and is somewhat problematic. Undiscovered reserves cannot be predicted with reasonable certainty, except that the potential recovery may be as large as several million barrels of oil and associated natural gas. Although horizontal wells were used to develop oil and gas reserves in fractured shale reservoirs in southeast Wyoming, overall results have been disappointing in the Powder River Basin. Unless there are a few economic wells drilled, it is unlikely that this play will have significant development in the foreseeable future.

LEASING

After initial field work, research, and subsurface mapping (which sometimes includes use of seismic data), leasing is often the next step in oil and gas development. Leasing may be based on speculation, with the most risky leases usually purchased for the lowest prices.

Leases on lands where the U.S. owns the oil and gas rights are offered via oral auction at least quarterly. Their maximum size is 2,560 acres and the minimum bid is $2.00 per acre. An administrative fee of $75.00 per parcel is charged and each successful bidder must meet citizenship and legal requirements. Leases are issued for a ten year term and a 12.5% royalty rate on production is required to be paid. Leases which become productive, are held by production and do not terminate until all wells on the lease have ceased production. Many private oil and gas leases contain a " Pugh clause", which allows only the developed portion of the lease to be held by production. However, federal leases have no such clause, allowing one well to hold an entire lease.

Wyoming lease sales are held on even numbered months, usually in Cheyenne. Since August 1996, only lands requested for lease have been offered. Before that, virtually all federal lands available for lease were offered at each sale. Each lease contains restrictive stipulations which protect potentially affected resource values.

The number of federal acres in the BFOA offered for lease and leased, on a sale-by-sale basis, is shown in Figure 6. No sale was held in April of 1996. Note the abrupt increase in acreage leased during the June-December 1998 period. For 1998, over 660,000 acres were leased. The additional acreage offered and leased, was mostly in Johnson and Sheridan counties. That increase was due to increased interest in CBM.

The total bonus bid amount for each sale and the average per acre bid for federal oil and gas leases in the BFOA are shown in Figure 7. Bids are shown on a sale-by-sale basis. Again, no sale was held in April of 1996. Note the steady decline in average bid before December 1995. Beginning in December 1995, the average bid began to increase. Bids began to increase at an even higher rate starting in August of 1997. Those increases were due almost entirely to increased interest in CBM. Since December 1998 the amount of acreage leased and bonus money received has dropped substantially. This is probably because nearly all available federal acreage in the CBM play area is now under lease.

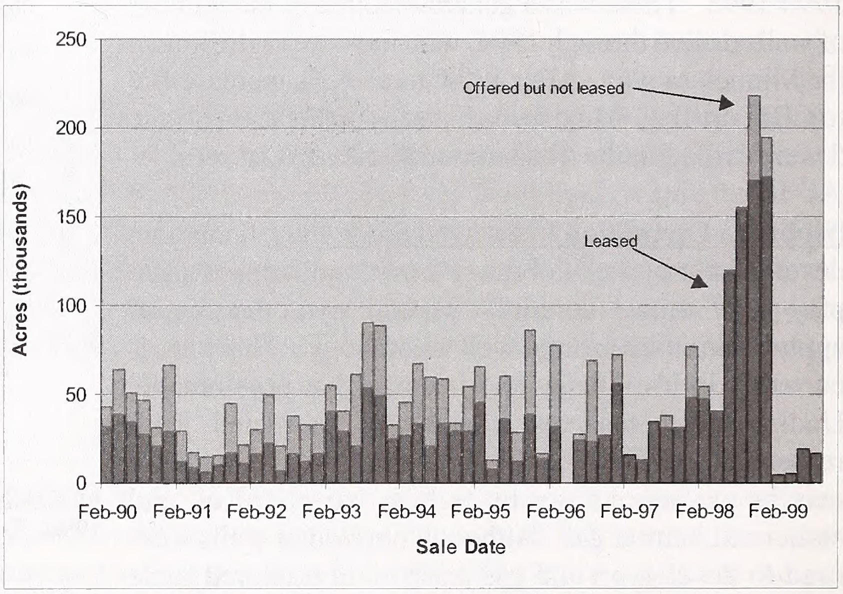


Figure 6 Federal oil and gas lease acres offered and leased for BFOA. Data are from BLM files.

For the period surveyed in Figure 7, about $83 million in total bid bonuses was received for land in the BFOA. About $51 million appears to have been bid to obtain leases for their CBM potential. Maps 3 and 4 highlight average dollar-per-acre bids compiled on a township-by-township basis. They compare federal oil and gas leasing in 1995 and 1998. These maps show the dramatic increase in lease biding in the CBM play area. Highest bids were centered in the BFOA.

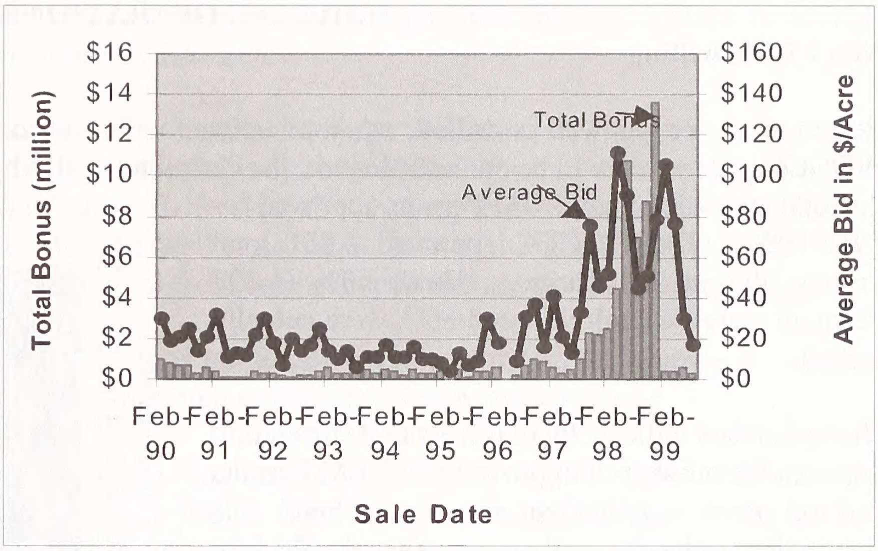


Figure 7 Federal oil and gas lease sale bid results for BFOA. Data are from BLM files.

Many of the federal leases in the CBM play area are large (more than 1,000 acres) and the entire lease will be held by production until the last well ceases production. For most leases this will be many years beyond their primary term. Since these leases will be held by production, it will be more difficult for others to acquire enough acreage to justify tests of deeper horizons. This will suppress development potential of the deeper horizons in the CBM play area.

The amount of federal oil and gas acreage under lease to 2010 is projected to be between 1.5 and 3.0 million acres. Acreage leased annually is projected to average between 100,00 and 500,000 acres. Average bids are estimated to be between $10 and $50 per acre.

SEISMIC SURVEYS

Seismic surveys on Bureau managed surface are authorized by approval of Notices of Intent to Conduct Geophysical Operations (Notices). From 1984 through 1998 the number of approved Notices has decreased substantially (Figure 8). Until a sustained oil price in excess of $30.00 per barrel occurs, the number of Notices will probably remain low. It is questionable whether a price increase would spur new Notices, since the BFOA already has extensive seismic coverage. Much of this existing data could probably be reprocessed with computers, rather than making new on-the-ground seismic surveys.

There has been recent interest in three-dimensional surveys. Although more expensive than conventional seismic surveys, they give a three-dimensional picture of the subsurface. Most of these surveys have been over or near oil fields in eastern Campbell County where there is little Bureau managed surface. If successful, three-dimensional surveys could increase Notices to about 15 per year. Seismic data is not generally used in the CBM play, therefore, activity in this play is not expected to increase the number of Notices.

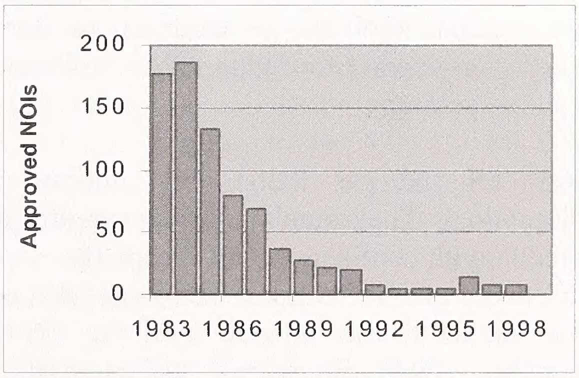


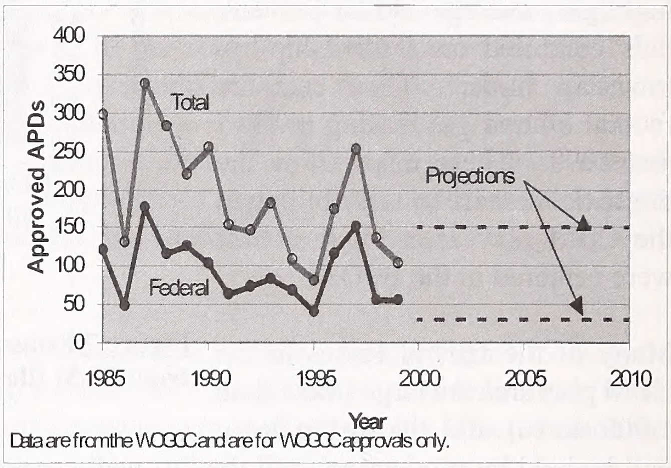
Figure 8 Approved Notices on BLM managed surface in the BFOA. Data are from BLM files.

DRILLING OPERATIONS

Non CBM Drilling

Before an oil or gas well is drilled, an Application for Permit to Drill (Permit) must be filed with the WOGCC. If the well will be on federal lands, the Permit must also be filed with the Bureau. Figure 9 plots the total and federal non CBM Permits approved for 1985-1999. The WOGCC approved 2,851 total Permits during that period. About 50% (1,397 Permits) were Federal. Around 80% were actually drilled.

Historical data indicate there is a general correlation between the number of approved non CBM Permits and oil price. Although not shown here, this correlation indicates a sharp increase in Permits would not be expected until oil prices are above $25 to $30 per barrel for a sustained period.



Data are from the WOGCC and are for WOGCC approvals only.

Figure 9 Approved non CBM Permits (APDs) and projections through 2010

Historical data indicates total non CBM Permits will range from 100 to 300 per year, through 2010. They could possibly go as high as 400 per year, although this is not likely unless oil prices are above $25-$30 per barrel for a sustained period. The number of approved Federal Permits is expected to range from 30 to 150 annually with a possible high of 200.

General areas of anticipated development activity in the BFOA are shown on Map 5. This map shows the general areas of anticipated drilling activity, exclusive of CBM, through 2010. It was drawn after reviewing information on:

- areas of past drilling activity;
- the oil and gas plays outlined by Dolton, et al (1990);
- information obtained from Glaser (1992);
- federal oil and gas lease sale results; and
- a general knowledge of Powder River Basin geology.

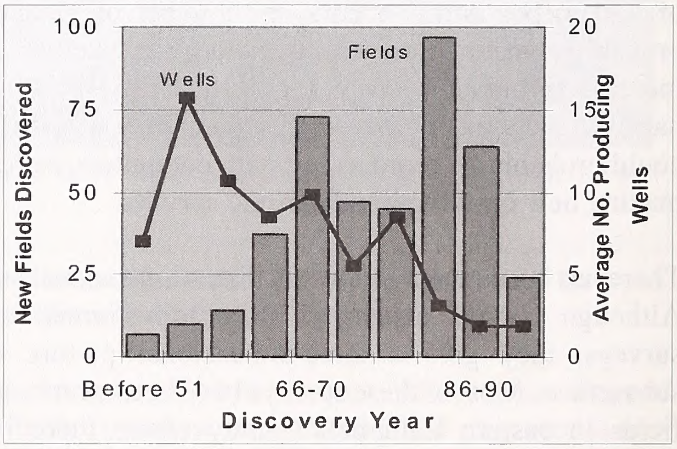


Figure 10 Number of oil and gas field discoveries and the average number of field wells producing in 1997. Data are from WOGCC.

New oil and gas fields will continue to be discovered. Their number and size are difficult to predict with confidence. As Figure 10 shows, the discovery rate of fields has been somewhat erratic, but the trend was upward until the 1981-1985 interval. Field discoveries peaked in the mid-eighties and the rate is now trending downward. During 1981-1990, an average of 16 non CBM fields were discovered annually in the BFOA. It is unlikely this field discovery rate will occur again. Past patterns indicate the number of new non CBM field discoveries should average between five and ten annually through 2010. Most of the total new fields discovered during the next several years will be CBM fields.

The size of field discoveries, as measured by the number of wells producing in 1997, shows a distinct downward trend over time (Figure 10). Many of the fields discovered since the mid-eighties are productive from the Minnelusa Formation. Although these fields typically produce from fewer than ten wells, they usually have relatively high oil recoveries on a per-well basis. About 20% of the non CBM fields discovered since 1980, produce less than 30,000 barrels of oil from only one well and are probably uneconomic.

Past trends suggests that newly discovered non CBM fields will produce from less than ten wells. Average field size of new discoveries will probably be from two to five productive wells per field.

Carbon Dioxide Drilling The injection of carbon dioxide gas into oil reservoirs to enhance recovery has received some attention by industry since the early 1980's. This type of enhanced oil recovery has been of great interest were existing waterflood operations in old fields are approaching the end of their productive lives. The Powder River Basin contains a large number of these types of oil fields that are candidates for carbon dioxide injection. A few pilot carbon dioxide floods have tested the feasibility of this process in the Powder River Basin. The oil and gas industry has been interested in proceeding with additional tests of this type of flooding, if a supply of carbon dioxide gas could be easily accessed. To get the volumes of gas required to operate a flood, a pipeline would be required to bring it to the local fields.

The Bureau is presently analyzing the affects of laying a pipeline(Petro Source Carbon Dioxide Pipeline Project Environmental Assessment) into the Powder River Basin from Baroil in south central Wyoming. The present target date for completion of this pipeline is late 2001 or prior to February of 2002. During this initial construction phase, the pipeline would only extend to the area of the Salt Creek and Sussex fields north of Casper. Howell Corporation appears to be the only company pursuing an early test of a carbon dioxide flood. They are actively planning a pilot flood in the north part of the Salt Creek Field for soon after the pipeline is installed. Westport Oil & Gas operates the Sussex field and does not appear to have immediate plans to start a flood. A second phase of pipeline construction is planned to the Hartzog Draw area, to the northeast of the Salt Creek Field. That extension would not be completed until 2003.

Information received indicates that very few new carbon dioxide flood related wells are likely to result in the short term (to 2010), because of this new access to a cheaper source of carbon dioxide gas. Targets for these types of floods are the larger developed oil fields. These candidate fields will have been fully delineated by past drilling and already undergone some type of water flood. At present there is no conclusive engineering database to allow a determination of what the best flood candidates are. In addition to the Salt Creek and Sussex fields, a number of other fields have already had some type of pilot carbon dioxide flood or have been mentioned as having potential for a flood. Those potential candidate fields are; Hartzog Draw, House Creek, Rozet, Kitty, Slattery, Meadow Creek, Culp Draw, Triangle U, House Creek, Hilight, Mush Creek, Lance Creek, Mule Creek, Dillinger Ranch, Cole Creek, and Glenrock.

Existing wellbores are expected to be adequate for use in any carbon dioxide flood and few new wells will be needed. Some new wells may be required to optimize the pattern of injection or production from a reservoir. Most new wells would be placed on an existing pad, where that new wellbore would be needed to replace an existing wellbore that has to be abandoned due to technical problems. The number of potential new wells are included in the projection made above for total non CBM drilling.

Horizontal Wells Horizontal drilling results in the BFOA have been disappointing. If future attempts to exploit oil and gas reserves in the Niobrara or other formations are successful, horizontal drilling activity could rise abruptly. Because of this uncertainty, estimates of horizontal wells drilled per-year range from two to ten or higher.

CBM Drilling

Wyoming CBM development activities are currently "booming" in the BFOA. This "boom" will almost certainly continue for a few more years, with the eastern side of the CBM development area (Map 2) being developed first. Because the western part of the CBM area contains a larger amount of federal mineral acreage than the eastern part of the CBM play area, delays in approving federal Permits may slow development in the western part of the area.

An estimate of recoverable resources was first required, to be able to determine reasonably foreseeable development scenarios for CBM drilling. See the "Oil and Gas Production" section (below) for procedures used to determine recoverable CBM resources for the five counties in Wyoming and for the Montana portion of the Powder River Basin. Using the estimate of recoverable resources, three scenarios for reasonably foreseeable development of CBM are predicted. The high resource estimate (28 trillion cubic feet of gas (TCFG)) was used in order to determine the maximum number of wells that can reasonably be expected to develop this play. The graphs shown below (Figures 11 and 12) are based on calculated reserves of 28 TCFG.

The three scenarios described are based on average recoveries of 0.20, 0.35, and 0.50 BCFG per well. These three average well recoveries allow low, moderate, and high projections of the cumulative number of wells that could be drilled (Figure 11). The moderate scenario projects 81,000 total CBM wells in Wyoming, with 50,000 wells drilled by 2010. The high scenario projects 139,000 total wells, with 80,000 being drilled by 2010.

Curves showing the number of wells producing at one time are also shown on Figure 11. They are derived from the cumulative drilling projection curves. The low projection indicates the maximum number of wells producing at one time is 38,000. The high projection is 81,000 producing wells. Notice that for all three scenarios the number of producing wells increases until 2013-2014 then declines 10-16 percent per year.

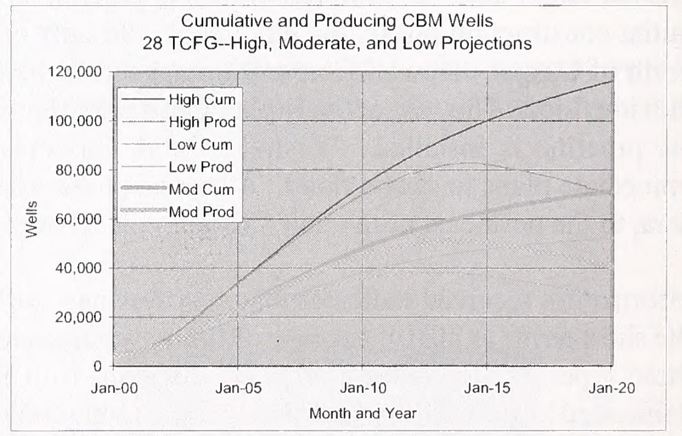


Figure 11 Projections of cumulative wells drilled and total producing wells for low, moderate, and high CBM scenarios. Data used are from WOGCC and BLM.

The number of wells drilled monthly is also projected for three scenarios (see Figure 12). These projections were derived from the graph shown in Figure 11. They are based on historical trends, drilling time, well depth, and estimated Permit approval rates. The minimum drilling rate is estimated to be 330 wells per month (3,960 wells per year) for the height of drilling activity (January, 2003 through December, 2007). A maximum rate was projected to be 690 wells per month (3,960 wells per year). About one-half of these wells would be federal.

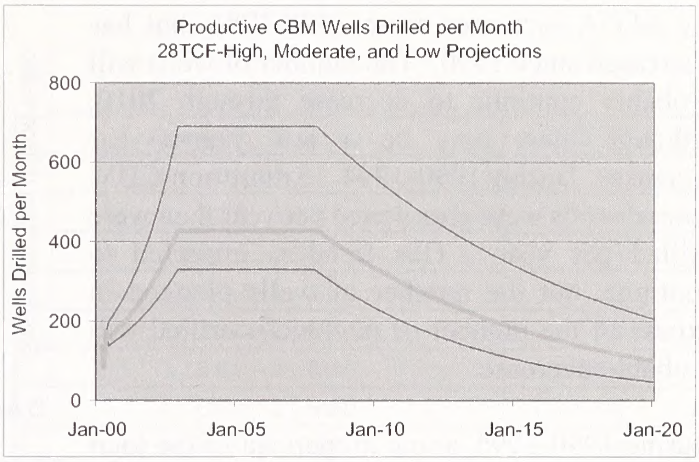


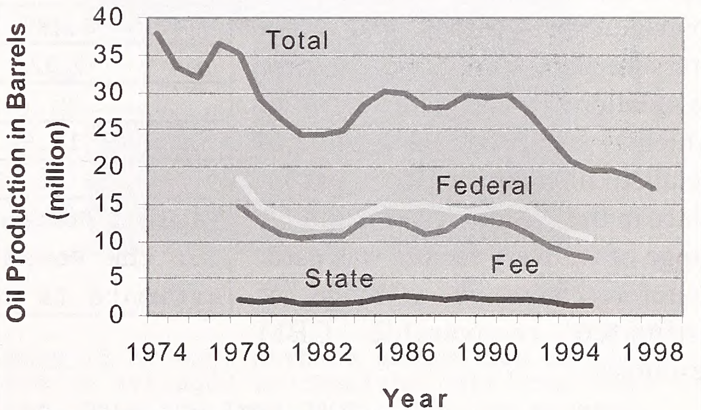
Figure 12 Estimate of productive wells drilled per month for low, high, and moderate scenarios.

Montana Recent proposals by operators indicate 9,551 wells will be drilled in the Montana portion of the Powder River Basin by 2010. This well projection appears to be too high, as discussed below in the "Recoverable CBM Resources in Montana" section.

OIL AND GAS PRODUCTION

Non CBM Production

Oil production from wells on federal, fee, and state minerals is shown in Figure 13. Production during 1984-1991 was relatively stable, but has declined sharply since. The decline averaged eight percent per year from 1991-1998. During 1990-1995 oil production from wells on federal minerals averaged 51% of the total oil production.



Data from PI/Dwights and WOGCC.

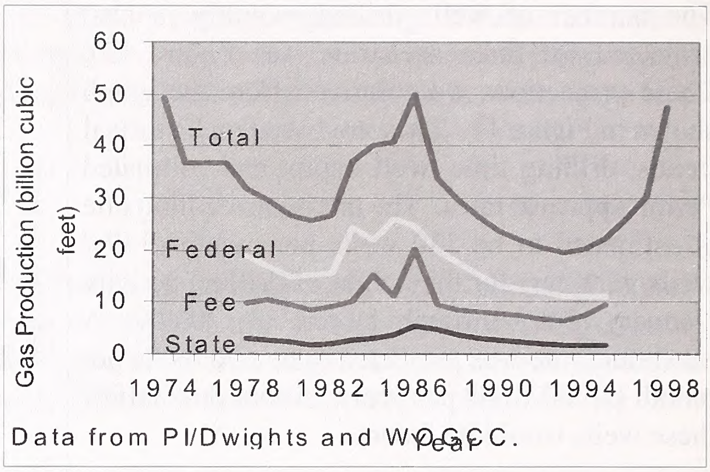
Figure 13 Oil production from federal, fee, and state wells in the BFOA.

Oil production will continue to decline about five to eight percent per year, unless large new discoveries are made, or there is a long term increase in price. A price increase would stimulate the search for new deposits, allow old fields to be produced longer, and allow increased use of enhanced oil recovery methods. It is unlikely that annual oil production will again reach 30 million barrels.

Gas production from wells on federal, fee, and state minerals has been much more erratic (Figure 14). Total gas production declined 53 percent from 1987-1994. In 1994, CBM was only 12 percent of total gas production in the BFOA. The gas production decline was reversed in 1995 due to increasing CBM production. Total gas production increased 21 percent per year since 1994. This trend is expected to continue.

The total number of non CBM producing wells in the BFOA increased from 1978-1984, but has decreased since 1990. The number of wells will probably continue to decrease through 2010, although there may be a few year-to-year increases. During 1990-1994, 58 more non-CBM federal wells were abandoned per year than were drilled per year. This trend is expected to continue, but the number of wells plugged in excess of the number of new wells drilled will probably decrease.

During 1990-1995, about 50 percent of the total producing wells in the BFOA were federal wells. The number of productive federal wells is expected to remain at about 50% of total productive wells.



Data from PI/Dwights and WOGCC.

Figure 14 Gas production from federal, fee, and state wells in the BFOA.

CBM Production

Summary Recoverable resource estimates for CBM in the Powder River Basin vary widely. Five sets of recent estimates (including our estimates) are listed in Table 2. Because of the variation, the Wyoming Reservoir Management Group took the latest available information and made additional calculations for gas-in-place and recoverable CBM resources. Recently available coal tonnage, gas content, and water pressure data were used in these calculations. The data, some of which is still proprietary, allowed detailed calculations of total gas-in-place in the Powder River Basin. A range of recovery factors was used, therefore there is a range of estimated recoverable CBM resources.

Recoverable Res. TCFG	Source	Date
4.198-8.396-14.273	Potential Gas Comm.	March, 1998
9.329	Gas Research Inst.	1999
25.2	Goolsby and Assoc.	August, 1999
14.6	Lance Oil and Gas	August, 1999
16-23-28	BLM-WRMG	November, 2000

Table 2 Recent estimates of recoverable coal gas for the Powder River Basin. The Lance Oil and Gas estimate is unpublished.

Ninety eight percent of the CBM resources are in Campbell, Johnson, and Sheridan counties, Wyoming. Converse and Natrona counties contain the remaining two percent. Montana contains about two percent of the total estimated CBM methane resources in the Powder River Basin, excluding native lands.

Future CBM drilling was estimated (see "C BM Drilling", above) using 28 TCFG as the recoverable gas reserve. This is the high estimate and was used to assess possible impacts at the highest potential drilling rate. Three reasonably foreseeable development scenarios were calculated based on different average well recoveries. The moderate scenario projects 81,000 total CBM wells in Wyoming, with 50,000 wells drilled by 2010. The high scenario projects 139,000 total wells, with 80,000 being drilled by 2010.

Methodology Gas-in-place and recoverable gas resources were calculated using a volumetric approach. Information used to make these calculations was:

1. Coal tonnage data from the U.S. Geological Survey was used. Data was obtained from coal outcrops and 18,207 drill holes. About ¾ of the drill holes were for coal assessment; the remainder were oil and gas wells. Coal tonnage was calculated using the Wood et al (1983) method for each resource classification {measured, indicated, inferred, and hypothetical (Flores 1999)}. Only coal beds 20 feet thicker or more were included. Tonnages were calculated over the intervals shown in Table 3. Conversion factors of 1,750 tons/acre foot for lignite and 1,770 tons/acre foot for subbituminous coal were used (Flores 1999).

Depth (Feet)	scf/ton
0-200	3
200-500	13
500-1,000	27
1,000-1,200	38
1,200-1,500	43
1,500-2,000	56
2,000-2,500	68
over 2,500	78

Table 3 Depth intervals and gas content (scf/ton = standard cubic feet per ton) for Powder River Basin.

2. Gas content in the coal was determined based on an average synthesized methane adsorption isotherm (Figure 15). This isotherm was constructed from 28 to 37 synthesized isotherms obtained from coal core samples from the Powder River Basin. The pressure shown in Figure 15 is the pressure at which CBM begins to desorb, or escape from coal. Much of the original data is still confidential.

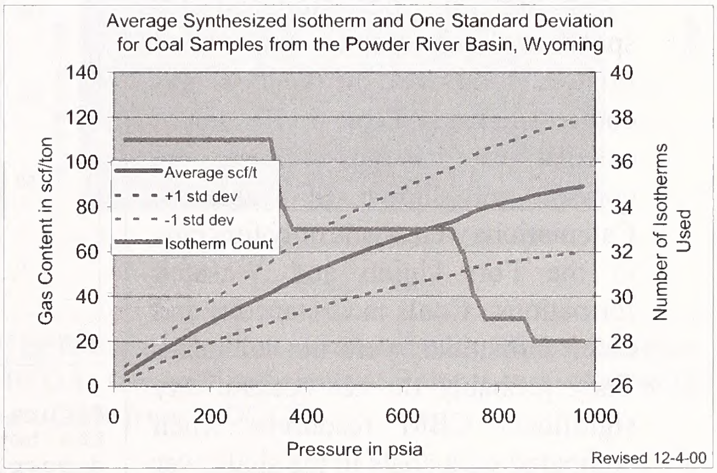


Figure 15 Average methane adsorption isotherm based on averaged synthesized data from coal cores. Data are from USGS, industry sources, and WOGCC.

3. A method to calculate pressure at the top of coal, at different coal depths, is needed in order to calculate gas-in-place at those depths. The pressure at the top of the coal must first be determined. To get an estimate of that pressure, data from 18 water monitor wells was used to correlate depth of the coal and depth to the top of water (piezometric surface). Figure 16 shows this correlation. Several of these wells are clustered in one area, therefore those wells were averaged and one averaged well was plotted on the graph. If the depth to top of coal is known, then Figure 16 is used to determine depth to top of water. The depth to top of water is then multiplied by 0.433 psi/foot (fresh water gradient) to obtain pressure at the top of the coal of interest.

4. The water monitor well data indicates that the pressure exerted by the water in the coal does not allow its gas to escape. Therefore, some water must first be removed to lower pressure, and allow

the coalbed methane to desorb. At some point pressure will be lowered enough for the gas in the coal to be desorbed. The initial desorption pressure can be estimated by using water monitor well data. Several water monitor wells have measured the lowering of the water level and initial gas desorption pressure. Figure 17 shows a correlation between initial pressure at the top of the coal and initial desorption pressure. After initial desorption pressure is determined the graph in Figure 15 can be used to estimate gas content in the coal. Coal gas contents in standard cubic feet per ton (scf/ton)used for specific depth intervals are shown in Table 3.

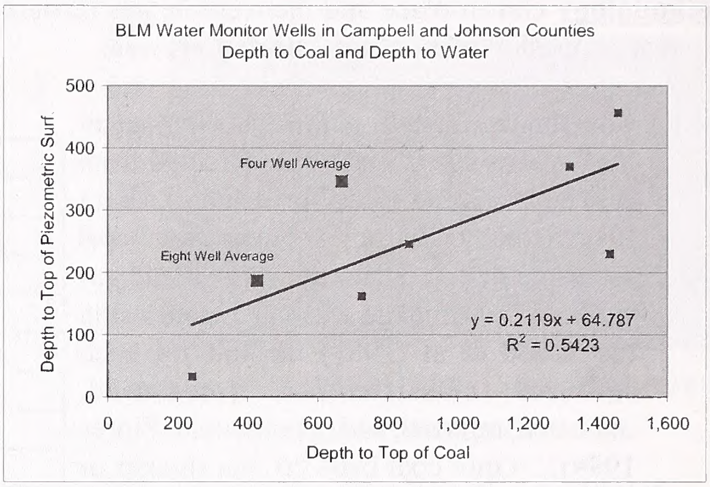


Figure 16 Correlation of coal depth and depth to top of water, in monitor wells. Data are from BLM files.

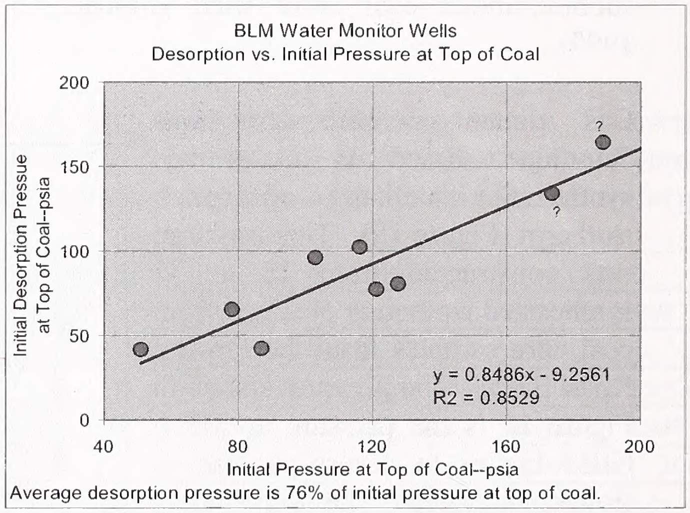


Figure 17 Correlation between pressure at the top of the coal and initial coal gas desorption pressure in water monitor wells.

5. Gas-in-place calculations can be made by multiplying coal tonnage for specified depth intervals (calculated in item 1, above) by the coal gas contents listed in Table 3. Results of calculations for gas-in-place, by county, are shown in Table 4. Calculations were made only for coals in the Fort Union and Wasatch formations. Coals in Cretaceous and older formations were not included. They probably do not contain any significant CBM resources when compared with coals in the shallower Fort Union and Watch formations.

6. After gas-in-place has been calculated, recovery factors can be applied to determine recoverable gas resources. Recovery factors used in this estimate of recoverable resources are summarized in Table 5. Determination of a recovery factor is difficult and subject to considerable speculation, therefore a range of recovery factors (low, moderate, and high) was used.

County	Gas-In-Place	Recoverable Resources (BCFG)		
	BCFG	Low	Moderate	High
Campbell	15,411	7,644	9,945	12,258
Converse	666	327	426	526
Johnson	13,523	6,722	8,741	10,773
Natrona	24	12	15	19
Sheridan	5,933	2,928	3,810	4,703
WY Total	35,557	17,633	22,937	28,279

Table 4 Gas-in-place and estimates of recoverable CBM resources for the Powder River Basin.

Recoverable CBM Resources in Wyoming Using the procedure described above, recoverable resources for five counties in Wyoming were calculated. Table 4 shows the low, moderate, and high estimates for recoverable resources for each county. The high estimate totals 28 TCFG for the Wyoming part of the Powder River Basin.

Recoverable CBM Resources in Montana The resource in the Montana part of the Powder River Basin is minor relative to Wyoming's resource. Using the approach described above in "Methodology", gas-in-place resources are 479 BCFG and recoverable resources are 205 to 343 BCFG. Only about one and a half percent the total Powder River Basin gas-in-place is in Montana, exclusive of the Indian reservations.

Depth	Recovery Factors		
	Low	Moderate	High
0-200 ft.	2%	10%	25%
Over 200 ft.	50%	65%	80%

Table 5 Recovery factors used to calculate CBM resources in the Powder River Basin.

Recent operator proposals indicate 9,551 wells will be drilled in Montana by 2010. The average well is projected to recover 0.3 BCFG. Multiplying total wells by recovery per well, indicates at least 2,900 BCFG would be recovered. This is much larger than the 205 to 343 BCFG thought to be recoverable from the coals. The number of actual CBM wells that could be drilled to produce the recoverable resource of 205 to 343 would be much less than the 9,551 wells proposed.

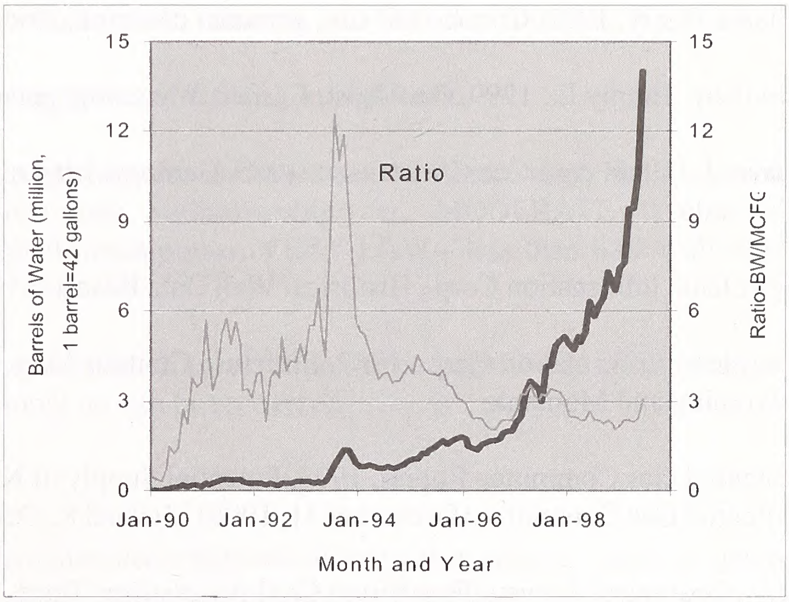


Figure 18 Water production associated with CBM production in the BFOA. One million barrels of water is equivalent to 129 acre feet. Data from WOGCC.

Water Production Large quantities of water are produced with CBM. During June 1999, 3.4 barrels of water were produced for every thousand cubic feet of CBM. This ratio should decrease over time because water production generally declines during the life of a CBM well. Figure 18 shows water production associated with CBM production in the BFOA. During June 1999, 14 million barrels of water (1,800 acre feet) were produced in the BFOA.

CONCLUSIONS

A "boom" in CBM development is currently underway in the BFOA. Gas production has increased sharply and will probably continue to increase for the next few years. Oil and gas development, exclusive of CBM, will continue to slowly decline. Oil production will continue to decline. Seismic activity as measured by the number of approved Notices, has increased from the low activity levels of the early 1990s but will probably not go much higher. The amount of federal acreage under lease has increased substantially since 1997. Because federal leases do not contain a "Pugh clause", much of the federal acreage under lease in the CBM area will be held by production for many years after the primary lease term.

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Wyoming Oil and Gas Conservation Commission, well files and internet website www.wogcc.state.wy.us/

GLOSSARY

Abandon To cease producing oil and/or gas from a well. This may involve several steps: one or more cement plugs are placed in the borehole to prevent migration of fluids between the different formations, equipment is removed, and the wellsite is reclaimed.

Acquired Minerals Mineral rights that were patented into non federal ownership and were later reacquired by the United States.

BCFG Billion cubic feet of gas.

BOPD Barrels of oil per day, this is usually the unit of measure for oil production at the wellhead. One barrel is 42 U.S. gallons.

BFOA Buffalo Field Office area, comprised of Campbell, Johnson, and Sheridan counties, Wyoming.

CBM Coalbed methane, natural gas originating from and residing in coal beds.

Development Potential Oil and gas development potentials are based on estimated average drilling density and are defined as follows: HIGH--over one well/township/year, MODERATE--0.2 to 1.0 wells/township/year, LOW--less than 0.2 wells/township/year, VERY LOW-- less than 0.02 wells/township/year, ZERO--no drilling.

Enhanced Oil Recovery A process where chemicals such as surfactants or carbon dioxide are injected into the reservoir to mix with the oil so that additional oil can be recovered.

MMBO Million barrels of oil.

Occurrence Potential HIGH--There is a demonstrated existence of petroleum source, reservoir quality strata, and traps. Areas of high potential have discovered oil occurrences or free oil recovery from well tests. MODERATE--There is direct or indirect geological evidence that petroleum source, reservoir quality strata, and trapping mechanisms are present. Discovered occurrences are not present but there may be shows of oil in core or drill stem tests. LOW--There is geological evidence that a petroleum source, reservoir quality strata, or trapping mechanisms are not present. NONE--There is a demonstrated absence of a petroleum source, reservoir quality strata, or trapping mechanisms. Demonstrated absence means physical evidence documented in geological literature.

Oil and Gas Field A natural accumulation of oil and gas in the subsurface. Oil and gas may be present in two or more reservoirs at different depths.

Oil and Gas Lease A federal oil and gas lease is a legal document that gives the lease holder the right to explore for and develop any oil and gas that may be present under the area designated in the lease while complying with any surface use conditions which may have been stipulated when the lease was issued.

Oil and Gas Reservoir A geologic layer containing hydrocarbons and enough porosity and permeability so that the hydrocarbons can be produced.

Play The geographic extent of an oil and/or gas bearing formation or interval.

Public Domain Minerals Mineral rights that have always been the property of the United States.

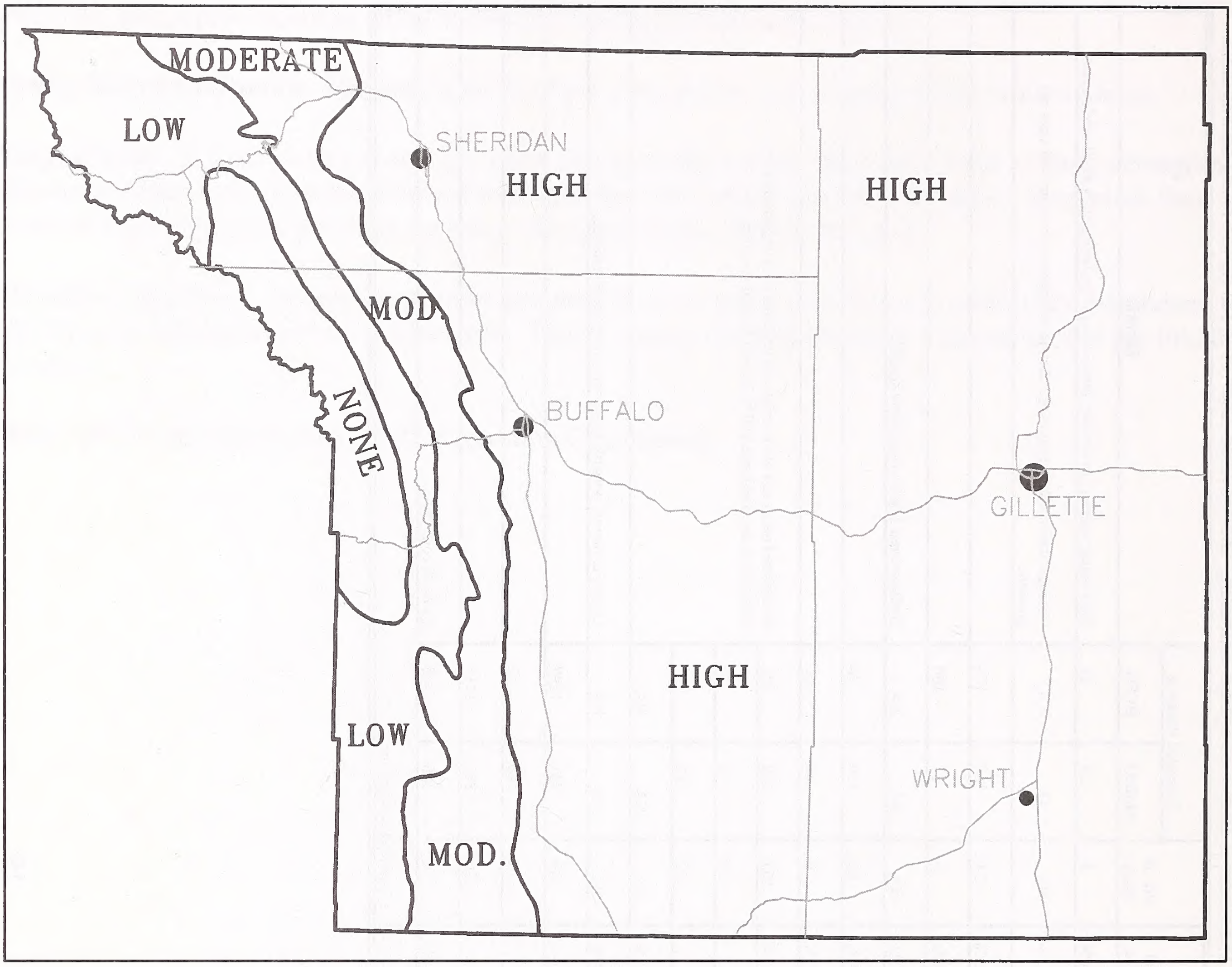
Pugh Clause A term in an oil and gas lease that prevents a productive well from holding acreage not allocated to that well. In other words if well spacing is 40 acres/well, one well cannot keep more than 40 acres of the oil and gas lease from expiring after the primary term of the lease.

Secondary Recovery A process whereby pressure in an oil and gas reservoir is artificially maintained or increased so that more oil can be recovered. This is usually done by injecting water or natural gas into the reservoir.

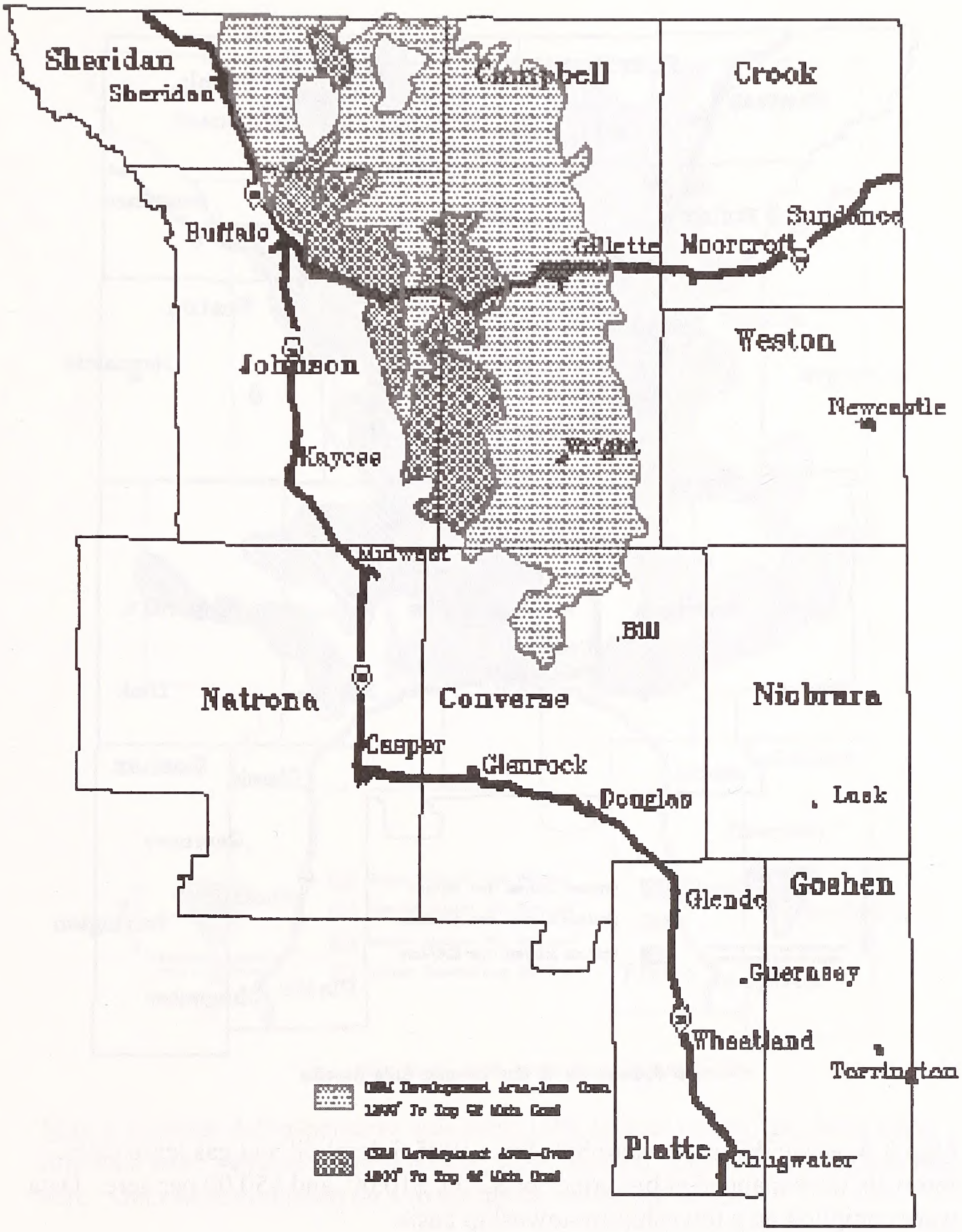
WOGCC Wyoming Oil and Gas Conservation Commission

Table 1 Summary of all the oil and gas plays evaluated by Dolton, et al (1990). The reader is cautioned against estimating undiscovered reserves in the BFOA based on this table.

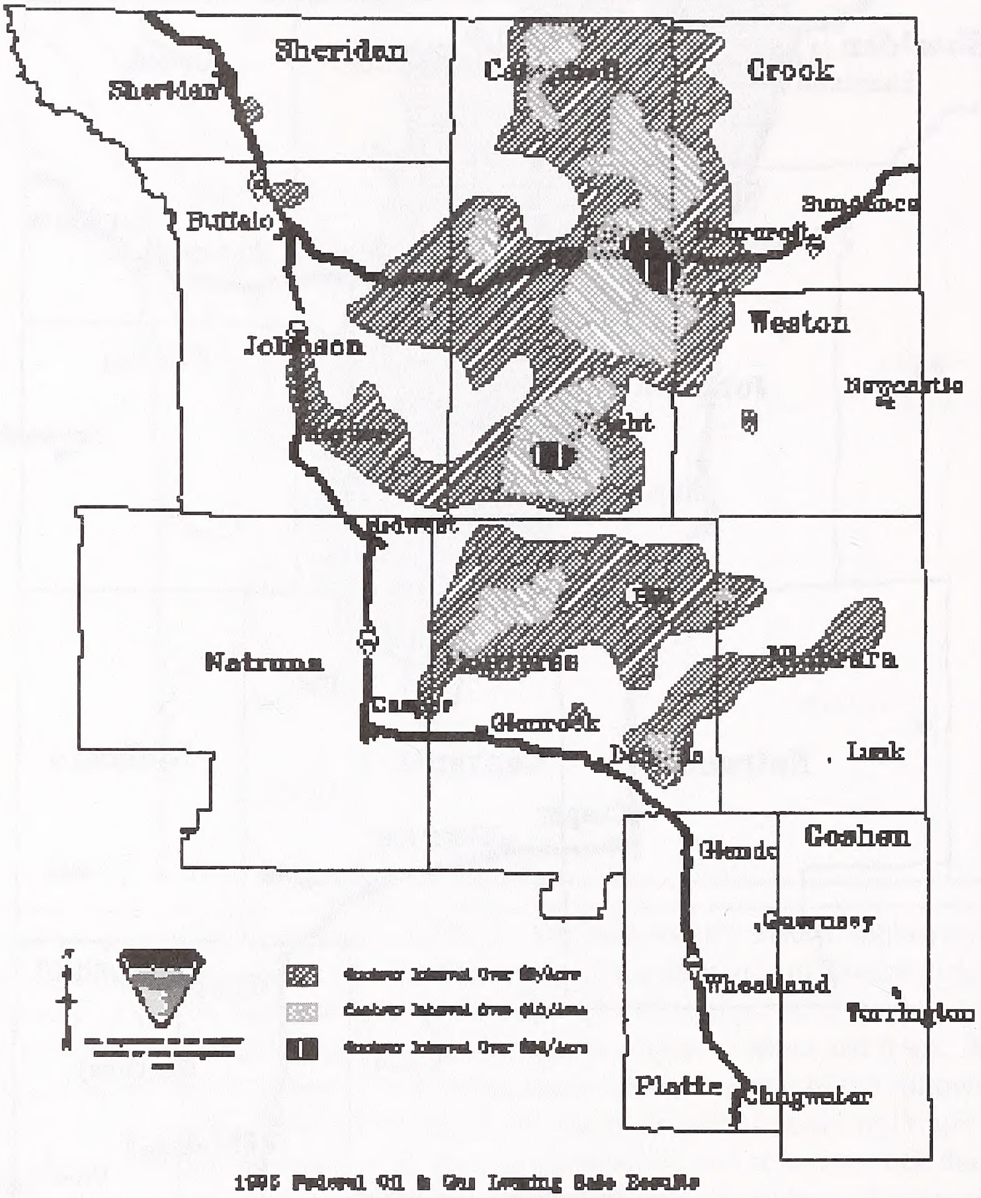
Oil and Gas Play	Total Play area	Play Area in BFOA	% of Play Area in BFOA	% of BFOA in Play Area	No. of fields	Estimated Reserves		Remarks
						MMBO	BCFG	
Basin Margin Anticline	8.12	1.37	6.0%	15.6%	5	24	21	Exploration nearing conclusion, future discoveries probably in small subtle traps.
Basin Margin Subthrust	2.12	0.54	25.5%	7.3%	NA	NA	NA	Geologic data limited, accurate prediction of future reserves or field sizes not possible.
Dakota	18.63	0.77	4.1%	10.5%	21	158	110	
Deep Frontier	5.47	0.85	15.6%	11.6%	6	37	100	
Lakota	21.21	4.06	19.2%	55.2%	NA	NA	NA	Undiscovered fields are probably small.
Leo	8.05	0.30	3.7%	15.6%	60	110	30	
Mesaverde & Lewis (stratigraphic)	7.99	4.07	42.7%	46.3%	10	66	91	
Minnelusa (total)	17.01	3.22	18.9%	43.7%	165	822	203	In explored area most discoveries will be fields with 3MMBO or less. In unexplored area field size will be similar to explored area.
Minnelusa (explored area)	NA	NA	NA	NA	139	98	10	
Minnelusa (unexplored area)	NA	NA	NA	NA	139	775	103	
Minnelusa (less prospective)	4.93	0.00	0.0%	0.0%	NA	NA	NA	
Mowry Shale	11.63	4.06	34.1%	53.9%	NA	NA	NA	Lightly explored, possible large nonconventional resource.
Muddy (total)	21.25	0.00	19.0%	55.0%	30	441	1298	
Muddy (explored area, shallow)	NA	NA	NA	NA	10	60	82	
Muddy (unexplored area, deep)	NA	NA	NA	NA	30	381	1216	
Shannon marine shelf	7.99	4.07	48.4%	55.3%	20	128	103	Sx & Sh combined
Sussex marine shelf	10.77	4.06	32.1%	47.0%	(combined w/shannon)			



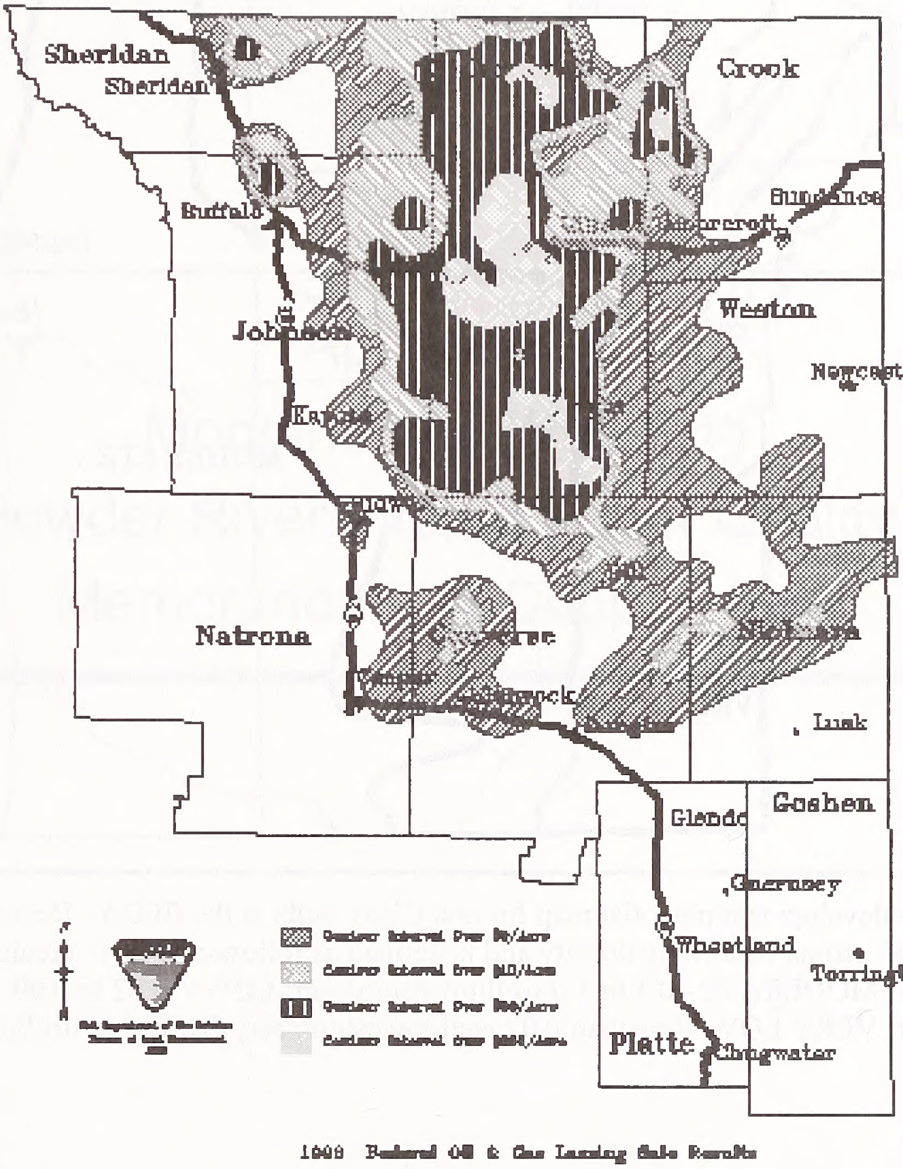
Map 1 Oil and gas occurrence potential map of BFOA. Definitions are: HIGH–Inclusion in a U.S. Geological Survey play. Documented or physical evidence of the existence of source rock, thermal maturation, and reservoir quality strata and traps. MODERATE–Geophysical or geologic indications of the presence of source rock, thermal maturation, and reservoir quality strata and traps. Indications of occurrence are based on indirect evidence. LOW-Indications that one or two of the following may not be present: (1) source rock, (2) thermal maturation, or (3) reservoir quality strata and traps. NONE-There is a demonstrated absence of source rock, thermal maturation, and reservoir rock that precludes the occurrence of hydrocarbons. Demonstrated absence means physical evidence documented in geological literature.



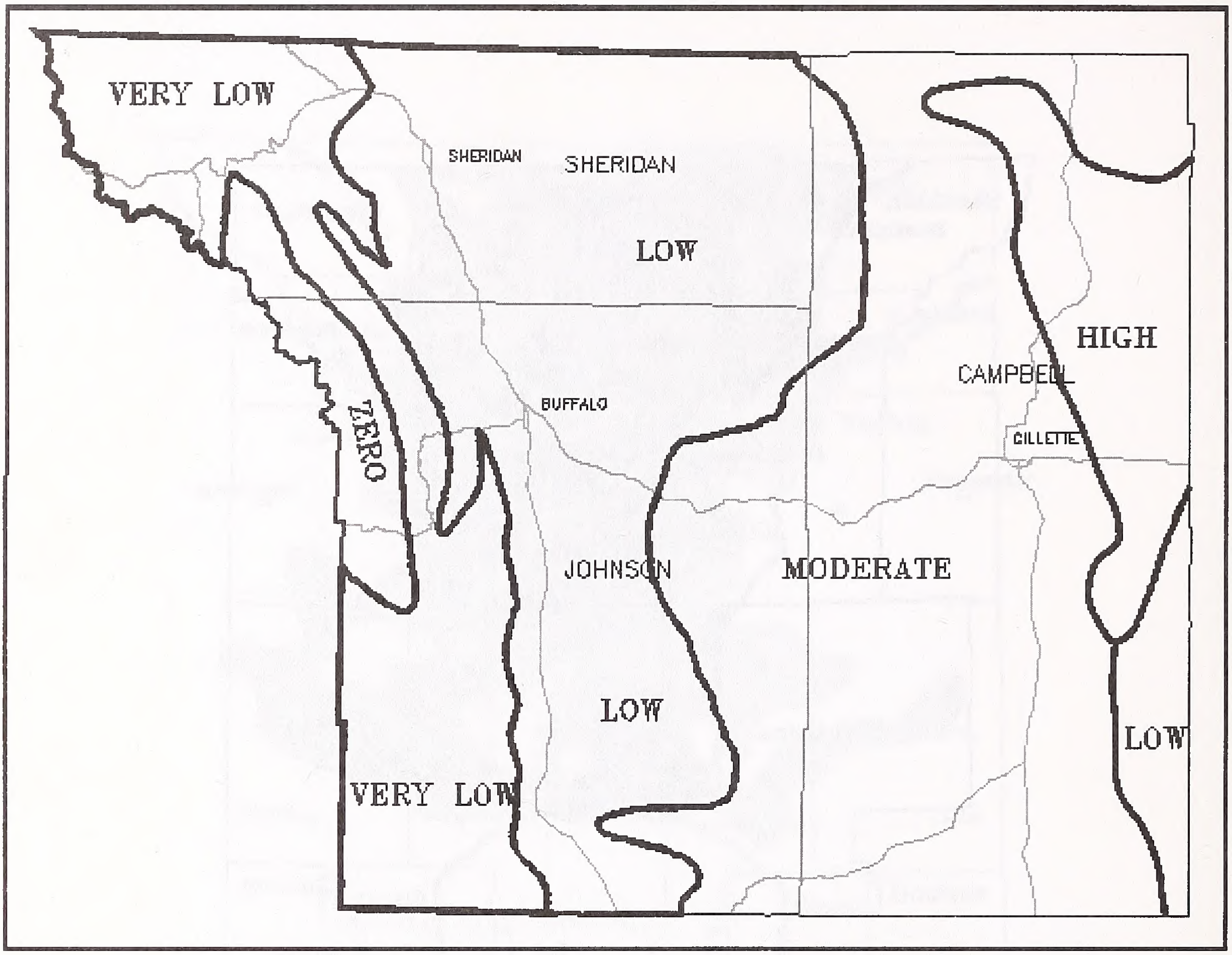
Map 2 CBM development area. The boundary is based on depth to top of coal, thickness of thickest coal, drilling activity, and federal oil and gas lease sale results.



Map 3 Average dollar-per-acre bids from 1995 federal oil and gas lease sales. Intervals were mapped at bid prices of $2.00, $10.00, and $50.00 per acre. Data were compiled on a township-by-township basis.


Sheridan
Sheridan
Crook
Buffalo
Sundance
Moorcroft
Johnson
Weston
Newcastle
Kaycee
Natrona
Converse
Casper
Glenrock
Douglas
Niobrara
Lusk
Glendo
Goshen
Guernsey
Wheatland
Torrington
Platte
Chugwater
Contour Interval Over $2/Acre
Contour Interval Over $10/Acre
Contour Interval Over $50/Acre
Contour Interval Over $200/Acre
U.S. Department of the Interior
Bureau of Land Management
1998 Federal Oil & Gas Leasing Sale Results

Map 4 Average dollar-per-acre bids from 1998 federal oil and gas lease sales. Intervals were mapped at bid prices of $2.00, $10.00, $50.00, and $200.00 per acre. Data were compiled on a township-by-township basis.



Map 5 Oil and gas development potential map for non CBM wells in the BFOA. Development potential is based on estimated drilling density and is defined as follows: HIGH– greater than 1 well/township/year; MODERATE– 0.1 to 1.0 well/township/year; LOW– 0.02 to 0.09 well/township/year; VERY LOW– less than 0.02 well/township/year; ZERO– no drilling expected.

Appendix B
Montana and Wyoming Powder River Interim Water Quality Memorandum of Cooperation

MONTANA AND WYOMING POWDER RIVER
INTERIM WATER QUALITY CRITERIA
MEMORANDUM OF COOPERATION

WHEREAS, the State of Montana and the State of Wyoming recognize a responsibility and an opportunity to cooperate work collaboratively to protect water quality in the Powder River Basin and to facilitate the development of Coal Bed Methane (CBM) activities in the respective states, and

WHEREAS, the State of Montana and the State of Wyoming will pursue a process that would establish respective responsibilities for managing and controlling salinity, SAR and other pollutants of concern; and

WHEREAS, the States of Montana and Wyoming have met in several meetings to work out the technical details of this cooperative approach; and

WHEREAS, the State of Montana and State of Wyoming realize that an interim effort is necessary until more stream flow and water quality data can be collected and analyzed to determine the assimilative capacity of waters in the Powder River drainage, and until the effects of CBM development are better known, and Montana completes the development and adoption of water quality standards, an EIS and a Total Maximum Daily Load (TMDL) plan for the basin; and

WHEREAS, the State of Wyoming recognizes Montana's downstream interests and has committed to apply certain limits on the development of CBM activities, during the term of this cooperative effort; and

WHEREAS, the State of Montana has recognized Wyoming's desire to continue to cautiously grant NPDES permits during this interim period; and

WHEREAS, the State of Wyoming has will work with and support Montana's efforts to develop long-term water quality standards and an equitable allocation of the assimilative capacity if one exists.

NOW THEREFORE, the parties enter into this Memorandum of Cooperation (MOC).

I. Parties.

The parties to this MOC are the signatories as set forth on Page 4. The director of the Wyoming Department of Environmental Quality is entering into this MOC to further the purposes of the Wyoming Environmental Quality Act W.S. 35-11-109(a)(ii). The director of the Montana Department of Environmental Quality is entering into the MOC to further the purposes of the Montana Water Quality Act , Title 75, Chapter 5, Montana Code Annotated.

II. Purpose of MOC

The purpose of this MOC is to document the parties' commitments and their intent to protect and maintain water quality conditions within Montana during an interim period while new CBM discharges in Wyoming are cautiously allowed. At the conclusion of this interim period, the parties shall negotiate a final MOC that will include recognition of protective water quality standards and allocation of any assimilative capacity.

III. Interim Threshold Criteria for Salinity and Sodium

1. Powder River

The two states will use the highest sampled monthly values of electrical conductivity (EC) from 1990 through 1999 for the Powder River at the Moorhead gauging station as interim upper threshold criteria. Montana shall monitor the Moorhead data and report to Wyoming the average monthly EC and its comparability to the appropriate monthly value. If in any given month the average EC exceeds the threshold criteria, as listed herein, Wyoming will use its ongoing monitoring of sodium levels to determine the potential source and cause of the exceedance. The results of this investigation will be reported to Montana in a timely manner. If the exceedance is found to be attributable to CBM discharges, Wyoming will initiate appropriate steps through its regulatory mechanisms to return salinity levels into conformity with this MOC.

The Upper Threshold Salinity Monthly Values (EC in μmhos/cm) for the Powder River at the Moorhead, Montana gauging station, based on the data from the 1990's are:

January	2200
February	2300
March	2300
April	1700
May	2100
June	2200
July	2800
August	2400
September	2600
October	1900
November	2000
December	1800

The two states recognize that sodium levels and the Sodium Adsorption Ratio (SAR) may have an effect on water uses. However, at this time no clear threshold can be developed due to a lack of data. The State of Wyoming will, through its monitoring program, track sodium concentrations in the Powder River above the state line, evaluate the source of changes through various modeling techniques and report the results of these evaluations to Montana.

2. Little Powder River

The states will use statistical step tests and 90th percentile, 90% confidence limits (90/90) for EC, SAR, and Total Dissolved Solids (TDS) derived from monthly flow weighted historic data as threshold criteria to indicate whether a change has occurred. Montana shall monitor the data from the Little Powder above Dry Creek, near Weston, and report the flow-weighted results to Wyoming. The step tests and 90/90 criteria will be based on a continuous and cumulative evaluation of available data from 1985 forward. Pre-1985 data will not be used because baseline conditions delineated by the older data sets differ from post-1984 conditions. If a step test shows a significant difference or the 90/90 confidence limit is exceeded, Wyoming will conduct an evaluation as to the possible source of the trend or exceedance and report the results to Montana in a timely manner. If the difference or exceedance is found to be attributable to CBM discharges, Wyoming will initiate appropriate steps through its regulatory mechanisms to return salinity levels into conformity with this MOC.

IV. Other Pollutants of Concern

Montana accepts Wyoming's antidegradation policy as protective of Montana's water quality standards. However, should Wyoming consider an application to degrade, Montana will be included as a participant in the waiver review process so that the states may equitably allocate any assimilative capacity.

V. Monitoring Program

Wyoming and Montana are committed to the development of a monitoring program to implement this MOC and to the development of a final MOC.

VI. Standard Frequency of Data Review and Evaluation

The parties will meet periodically and review the results of their respective monitoring programs, to promptly report evaluations and results, and review the overall success of the program.

VII. Term of MOC

It is the intent of the parties that this interim MOC is for a period of 18 months from its' effective date. During the fall of 2002 the parties anticipate re-negotiating a final MOC that will address meeting downstream standards for the Powder and Little Powder Rivers and TMDLs.

VIII. Public Participation

Opportunity for public participation was provided during the technical sessions that led up to this MOC. The parties are committed to keeping the public informed about the implementation and success of this MOC. All technical information and evaluations resulting from this MOC will be available to the public.

IX. Dispute Resolution

The parties agree that disputes that arise as a result of this MOC shall be resolved through communication and cooperative problem solving involving the parties

X. Amendment

This MOC may be amended or modified at any time upon the consent of all parties.

XI. Vacating MOC

Any party may withdraw from this MOC by providing written notice to the other parties.

XII. Effective Date

This MOC is effective upon the last date of signature by a party, as listed below.

1. **MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY**

(September 5, 2001)

Jan Sensibaugh, Director Date

2. **WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY**

(September 7, 2001)

Dennis Hemmer, Director Date

Appendix C
Standard Conditions of Approval

Appendix C — Standard "Conditions of Approval" APDs, BLM – Buffalo Field Office

Conditions of Approval, are applied to both APD and Sundry Notice Drilling Plans and Surface Use Plans when: 1) they are not specifically addressed in those plans and 2) they are needed to mitigate impacts to resource values identified at the onsite inspection or during review of the plans. The first section identifies standard conditions of approval applicable to development involving only coal bed methane. The second section identifies standard conditions of approval that are pertinent to all federal oil & gas lease development. Not all of the conditions in this second section are applicable to development of CBM.

It is important to note that site-specific mitigation are also developed by the BLM authorized officer, as needed, on a case-by-case basis at the onsite inspection to address special, unanticipated issues not addressed by a programmatic mitigation or standard conditions of approval (e.g., erosive soils, steep slopes, proximity to existing improvements, etc.) These special mitigating measures obviously cannot be listed here. The following are the standard conditions of approval that are always applied (if not already specifically addressed in the plans).

Any new mitigation resulting from analysis in this EIS will be disclosed in the Record of Decision and may be added or will replace or revise the standard conditions already identified in this plan.

Section 1 — Applicable to Coal Bed Methane Well Development Only

1. The operator is committed to all of the mitigation measures and monitoring contained in the Programmatic Mitigation Plan PRB O&G EIS Appendix M. The operator is also committed to the following **Standard "Conditions of Approval" for APD's.**

2. A pre-construction field meeting shall be conducted prior to beginning any dirt work approved under this POD. The operator shall contact the BLM Authorized Officer (responsible NRS @ 307-684-1100) at least 4-days prior to beginning operations so that the meeting can be scheduled. The operator is responsible for having all contractors present (dirt contractors, drilling contractor, pipeline contractor, project oversight personnel, etc.) including the overall field operations superintendent, and for providing all contractors copies of the approved POD, project map and BLM *Conditions of Approval* pertinent to the work that each will be doing.

3. Pits will be adequately fenced during and after drilling operations until pit is reclaimed so as to effectively keep out wildlife and livestock. Adequate fenc-

ing, in lieu of more stringent requirements by the surface owner, is defined as follows:

Construction materials will consist of steel or wood posts. Three or four strand wire (smooth or barbed) fence or hog panel (16-foot length by 50-inch height) or plastic snow fence must be used with connectors such as fence staples, quick-connect clips, hog rings, hose clamps, twisted wire, etc. Electric fences will not be allowed.

Construction standards: Posts shall be firmly set in ground. If wire used must be taut and evenly spaced, from ground level to top wire, to effectively keep out animals. Hog panels must be tied securely into posts and one another using fence staples, clamps, etc. Plastic snow fencing must be taut and sturdy. Fence must be at least 2-feet from edge of pit. 3 sides fenced before beginning drilling, the fourth side fenced immediately upon completion of drilling and prior to rig release. Fence must be left up and maintained in adequate condition until pit is closed.

4. Drilling pits will be closed as soon as possible, but no later than 90 days from time of drilling/well completion, unless the BLM Authorized Officer gives an extension. Squeezing of pit fluids and cuttings is prohibited. Pits must be dry of fluids or they must be removed via vac truck or other environmentally acceptable method prior to backfiling, recontouring and replacement of topsoil. Mud and cuttings left in pit must be buried at least 3-feet below recontoured grade. The operator will be responsible for recontouring any subsidence areas that develop from closing a pit before it is sufficiently dry.

5. The operator shall complete wells as soon as possible, but no later than 30 days after drilling operations, unless an extension is given by the BLM Authorized Officer.

6. Operators must submit a *Surface Use Data Summary Form* (Attachment A) as part of every Master Surface Use Plan.

7. If in the process of air drilling the wells there is a need to utilize mud, all circulating fluids will be contained either in an approved pit or in an aboveground containment tank. The pit or containment tank will be large enough to safely contain the capacity of all expected fluids without danger of overflow. Fluid and cuttings will not be squeezed out of the pit, and the pit will be reclaimed in an expedient manner.

Section 2 — Pertinent to All Oil and Gas Well Development

A. Construction

1. The operator will limit vegetation removal and the degree of surface disturbance wherever possible. Where surface disturbance cannot be avoided, all

practicable measures will be utilized to minimize erosion and stabilize disturbed soils.

2. Construction and drilling activity will not be conducted using frozen or saturated soil material during periods when watershed damage or excessive rutting is likely to occur.
3. Remove all available topsoil (depths vary from 4 inches on ridges to 12+ inches in bottoms) from constructed well locations including areas of cut and fill, and stockpile at the site. Topsoil will also be salvaged for use in reclamation on all other areas of surface disturbance (roads, pipelines, etc.). Clearly segregate topsoil from excess spoil material. Any topsoil stockpiled for one year or longer will be signed and stabilized with vegetation. Seed with annual ryegrass or other suitable cover crop.
4. The operator will not push soil material and overburden over side slopes or into drainages. All soil material disturbed will be placed in an area where it can be retrieved without creating additional undue surface disturbance and where it does not impede watershed and drainage flows.
5. Construct the backslope no steeper than ½:1, and construct the foreslope no steeper than 2:1, unless otherwise directed by the BLM authorized officer.
6. Maintain a minimum 20-foot undisturbed vegetative border between toe-of-fill of pad and/or pit areas and the edge of adjacent drainages, unless otherwise directed by the BLM Authorized Officer.
7. With the overall objective of minimizing surface disturbance and retaining land stability and productivity, the operator shall utilize equipment that is appropriate to the scope and scale of work being done for roads and well pads (utilize equipment no larger than needed for the job.)
8. To minimize electrocution potential to birds of prey, all overhead electrical power lines will be constructed to standards identified by the Avian Power Line Interaction Committee (1996).
9. The operator shall utilize wheel trenchers or ditch witches to construct all pipeline trenches, except where extreme topography or other environmental factors preclude their use.
10. A flare pit will be constructed on the well pad for use during drilling operations. It will be located at least 125 feet from the well head and will be located down-wind from the prevailing winds.
11. Pit will be **adequately** fenced during and after drilling operations until pit is reclaimed so as to effectively keep out wildlife and livestock. This requires that it be fenced on the three nonworking sides prior to drilling and on the remaining side **immediately** following rig release. Fencing will be constructed in accordance with BLM specifications. (Plastic snow fence is not acceptable fencing material for conventional wells.)

12. The reserve pit will be oriented to prevent collection of surface runoff. After the drilling rig is removed, the operator may need to construct a trench on the uphill side of the reserve pit to divert surface drainage around it. If constructed, the trench will be left intact until the pit is closed.

13. The reserve pit will be lined with an impermeable liner if permeable subsurface material is encountered. An impermeable liner is any liner having a permeability less than 10^{-7} cm/sec. The liner will be installed so that it will not leak and will be chemically compatible with all substances that may be put in the pit. Liners made of any man-made synthetic material will be of sufficient strength and thickness to withstand normal installation and pit use. In gravelly or rocky soils, a suitable bedding material such as sand will be used prior to installing the liner.

14. The reserve pit will be constructed so that at least half of its total volume is in solid cut material (below natural ground level).

15. If any cultural values (sites, artifacts, remains) are observed during operation of this lease/permit/right-of-way, they will be left intact and the Buffalo Area Manager notified. The authorized officer will conduct an evaluation of the cultural values to establish appropriate mitigation, salvage or treatment.

16. If paleontological resources, either large or conspicuous, and/or a significant scientific value are discovered during construction, the find will be reported to the Authorized Officer immediately. Construction will be suspended within 250 feet of said find. An evaluation of the paleontological discovery will be made by a BLM approved professional paleontologist within five (5) working days, weather permitting, to determine the appropriate action(s) to prevent the potential loss of any significant paleontological values. Operations within 250 feet of such a discovery will not be resumed until written authorization to proceed is issued by the Authorized Officer. The applicant will bear the cost of any required paleontological appraisals, surface collection of fossils, or salvage of any large conspicuous fossils of significant scientific interest discovered during the operation.

17. Culverts will be placed on channel bottoms on firm, uniform beds, which have been shaped to accept them, and aligned parallel to the channel to minimize erosion. Backfill will be thoroughly compacted.

18. The minimum diameter for culverts will be 18 inches. However, all culverts will be appropriately sized in accordance with standards in BLM Manual 9113.

19. Low water crossings will be constructed at original streambed elevation in a manner that will prevent any blockage or restriction of the existing channel. Material removed will be stockpiled for use in reclamation of the crossings.

20. Construction-related traffic will be restricted to approved routes. Cross-country vehicle travel will not be allowed.

21. Any facilities, pipelines, powerlines, pits, etc., that involve new surface disturbance and are not specifically addressed in the APD/POD, must be authorized by the BLM via a Sundry Notice prior to construction.

22. Pipeline construction shall not block nor change the natural course of any drainage. Pipelines shall cross perpendicular to drainages. Pipelines shall not be run parallel in drainage bottoms. Suspended pipelines shall provide adequate clearance for maximum runoff.

23. Pipeline trenches shall be compacted during backfilling. Pipeline trenches shall be routinely inspected and maintained to ensure proper settling, stabilization and reclamation.

24. The operator shall restrict travel on unimproved two-track roads during periods of inclement weather or spring thaw when the possibility exists for of surface damage from excessive rutting.

25. The operator shall institute measures such as surfacing, watering, use of non-saline dust suppressants, etc. on all roads authorized under this project in order to minimize impacts from fugitive dust emissions. The use of chemical dust suppressants on public surface will require prior approval from the BLM Authorized Officer.

26. Operators are required to obtain a National Pollution Discharge Elimination System (NPDES) Storm Water Permit from the Wyoming DEQ for any projects that disturb five or more acres (changing to one acre in early 2003). This general construction storm water permit must be obtained from WDEQ **prior** to any surface disturbing activities and can be obtained by following directions on the WDEQ website at http://deq.state.wy.us. Further information can be obtained by contacting Barb Sahl at (307) 777-7570.

27. In accordance with the U.S. Army Corps of Engineers (COE) General Permit 98-08 (Appendix D), a summary of the improvements and/or disturbance made to channels, wetlands and in-channel structures associated with this project will be submitted to the COE as a Statement of Compliance.

B. Operations/Maintenance

1. Confine all equipment and vehicles to the access road, pad, and area specified in the APD or POD.

2. All waste, other than human waste and drilling fluids, will be contained in a portable trash cage. This waste will be transported to a State approved waste disposal site immediately upon completion of drilling operations. No trash or empty barrels will be placed in the reserve pit or buried on location. All state and local laws and regulations pertaining to disposal of human and solid waste will be complied with.

3. Rat and mouse holes shall be filled and compacted from the bottom to the top immediately upon release of the drilling rig from the location.

4. The operator will be responsible for control of noxious weeds on all areas of surface disturbance associated with this project (well locations, roads, water management facilities, etc.) Use of pesticides shall comply with the applicable Federal and State laws. Pesticides shall be used only in accordance with their registered uses and within limitations imposed by the Secretary of Interior. Prior to the use of pesticides on public land, the holder shall obtain from the BLM authorized officer written approval of a plan showing the type and quantity of material to be used, pest(s) to be controlled, method of application, location of storage and disposal of containers, and any other information deemed necessary by the authorized officer to such use.

5. In areas of high concern relative to noxious weed infestations, the operator will be required to submit an integrated pest management plan. This plan will need to incorporate appropriate mitigation measures such as spraying herbicides, washing vehicles, etc. to ensure that noxious weed spread/impacts are minimized. Mitigation will be developed on a site-specific basis. Companies should contact the local County Weed and Pest office to ascertain information about weeds in their proposed project area.

6. All permanent above-ground structures (specify type of structures, e.g. , production equipment, tanks, transformers, insulators, etc.) not subject to safety requirements will be painted to blend with the natural color of the landscape. The paint used will be a color which simulates "Standard Environmental Colors." The color selected for this (site, project), is (name and Munsell Soil Color Number).

7. Sewage shall be placed in a self-contained, chemically treated porta-potty on location.

8. The operator and their contractors shall ensure that all use, production, storage, transport and disposal of hazardous and extremely hazardous materials associated with the drilling, completion and production of this well will be in accordance with all applicable existing or hereafter promulgated federal, state and local government rules, regulations and guidelines. All project-related activities involving hazardous materials will be conducted in a manner to minimize potential environmental impacts. A file will be maintained onsite containing current Material Safety Data Sheets (MSDS) for all chemicals, compounds and/or substances which are used in the course of construction, drilling, completion and production operations.

9. Produced fluids shall be put in test tanks on location during completion work. Produced water will be put in the reserve pit during completion work per Onshore Order #7.

10. The only fluids/waste materials which are authorized to go into the reserve pit are RCRA exempt exploration and production wastes. These include:
    - drilling muds & cuttings
    - rigwash
    - excess cement and certain completion & stimulation fluids defined by EPA as exempt

It does not include drilling rig waste, such as:

- spent hydraulic fluids
- used engine oil
- used oil filter
- empty cement, drilling mud, or other product sacks
- empty paint, pipe dope, chemical or other product containers
- excess chemicals or chemical rinsate

Any evidence of non-exempt wastes being put into the reserve pit may result in the BLM Authorized Officer requiring specific testing and closure requirements.

11. Operators are advised that prior to installation of any oil and gas well production equipment which has the potential to emit air contaminants, the owner or operator of the equipment must notify the Wyoming Department of Environmental Quality, Air Quality Division (phone 307-777-7391) to determine permit requirements. Examples of pertinent well production equipment include fuel-fired equipment (e.g., diesel generators), separators, storage tanks, engines and dehydrators.

12. Any potential impacts to archaeological sites, regardless of eligibility for the National Register of Historic Places (NHRP), must be disclosed to the appropriate surface owner by the operator prior to surface disturbance.

13. If this well is drilled during the fire season (June-October), the operator shall institute all necessary precautions to ensure that fire hazard is minimized, including but not limited to mowing vegetation on the access route(s) and well location(s), keeping fire fighting equipment readily available when drilling, etc.

C. Dry Hole/Reclamation

1. All disturbed lands associated with this project, including the pipelines, access roads, water management facilities, etc will be expediently reclaimed and reseeded in accordance with the surface use plan and any pertinent site-specific COAs.

2. Disturbed lands will be recontoured back to conform with existing undisturbed topography. No depressions will be left that trap water or form ponds.

3. The fluids and mud must be dry in the reserve pit before recontouring pit area. The operator will be responsible for recontouring of any subsidence areas that develop from closing a pit before it is completely dry. The plastic pit liner will be cut off below grade and properly disposed of at a state authorized landfill before beginning to recontour the site.

4. Before the location has been reshaped and prior to redistributing the topsoil, the operator will rip or scarify the drilling platform and access road on the contour, to a depth of at least 12 inches. The rippers are to be no farther than 24 inches apart.

5. Distribute the topsoil evenly over the entire location and other disturbed areas. Prepare the seedbed by disking to a depth of 4-to-6 inches following the contour.

6. Waterbars are to be constructed at least one (1) foot deep, on the contour with approximately two (2) feet of drop per 100 feet of waterbar to ensure drainage, and extended into established vegetation. All waterbars are to be constructed with the berm on the downhill side to prevent the soft material from silting in the trench. The initial waterbar should be constructed at the top of the backslope. Subsequent waterbars should follow the following general spacing guidelines:

Slope (percent)	Spacing Interval (feet)
≤ 2	200
2 – 4	100
4 – 5	75
≥ 5	50

7. The operator will drill seed on the contour to a depth of 0.5 inch, followed by cultipaction to compact the seedbed, preventing soil and seed losses. To maintain quality and purity, the current years tested, certified seed with a minimum germination rate of 80% and a minimum purity of 90% will be used. On BLM surface or in lieu of a different specific mix desired by the surface owner, use the following:

SPECIES-CULTIVAR	LBS PLS/ACRE

To be determined at the site-specific onsite inspection)

8. Slopes too steep for machinery may be hand broadcast and raked with twice the specified amount of seed.

9. Complete fall seeding after September 15 and prior to prolonged ground frost. To be effective, complete spring seeding after the frost has left the ground and prior to May 15.

10. The operator will reshape abandoned access roads by pushing the fill material back into the cuts. On roads to be permanently closed, waterbars are to be constructed near the contour across the shaped road, utilizing the spacing guidelines contained in No. 6 above.

11. Disk and seed the access road per number 6 above.

12. All rehabilitation work, including seeding, will be completed as soon as feasible following plugging.

13. Following reseeding, the location will be temporarily fenced off (**if not already fenced**) for at least two complete growing seasons to ensure long-term reclamation success, unless otherwise requested by the surface owner.

14. BLM will not release the performance bond until the area has been successfully revegetated (evaluation will be made after the second complete growing season) and has met all other reclamation goals of the surface owner and surface management agency.

15. A Notice of Intent to Abandon and a Subsequent Report of Abandonment must be submitted for abandonment approval.

16. For performance bond release approval, a Final Abandonment Notice (with a surface owner release on split-estate must be submitted prior to a final abandonment evaluation by BLM.

17. Soil fertility testing and the addition of soil amendments may be required to stabilize some disturbed lands.

18. Any mulch or seed utilized for reclamation needs to be certified weed free and be current year's tested.

D. Producing Well

1. The entire location will be fenced off with a 4-strand barbed wire fence (or sheep fence based on site-specific conditions), with H-braces on the corners and a cattleguard, far enough outside of disturbed areas and soil stockpiles to allow for perimeter rehab within the fenced location.

2. Landscape those areas not required for production to the surrounding topography as soon as possible. The fluids and mud must be dry in the reserve pit before recontouring pit area. The operator will be responsible for recontouring and reseeding of any subsidence areas that develop from closing a pit before it is completely dry.

3. Reduce the backslope to 2:1 and the foreslope to 3:1, unless otherwise directed by the BLM Authorized Officer. Reduce slopes by pulling fill material up from foreslope into the toe of cut slopes.

4. Production facilities (including dikes) must be placed on the cut portion of the location and a minimum of 15 feet from the toe of the back cut unless otherwise approved by the BLM Authorized Officer.

5. A dike will be constructed completely around the production facilities (i.e. production tanks, water tanks, and heater-treater). The dikes for the production facilities must be constructed of impermeable soil, hold 110% of the capacity of the largest tank plus 1-foot of freeboard, and be independent of the back cut.

6. Any chemicals used in treating the wells (e.g., corrosion inhibitor, emulsion breaker, etc.) will be in a secure, fenced-in area that has an appropriate secondary containment structure (dikes, catchment pan, etc.).

7. The load out line coming from the oil/condensate tank(s) will have a suitable containment structure to capture and recycle any oil spillage that might occur.

8. Individual production facilities (tanks, treaters, etc.) will be adequately fenced off (if entire facility not already fenced off).

9. Any spilled or leaked oil, produced water or treatment chemicals must be reported in accordance with NTL-2A and immediately cleaned up in accordance with BLM requirements. This includes clean-up and proper disposition of soils contaminated as a result of such spills/leaks.

10. Distribute stockpiled topsoil evenly over those areas not required for production and reseed as recommended. **Due to fragile soils, the entire well location may need to be fenced off to ensure revegetation and stability of the reclaimed location perimeter throughout the producing life of the well, subject to the discretion of the BLM Authorized Officer.

11. Upgrade and maintain access roads and drainage control (e.g., culverts, drainage dips, ditching, crowning, surfacing, etc.) as necessary and as directed by the BLM Authorized Officer to prevent soil erosion and accommodate safe, environmentally-sound access.

12. Prior to construction of production facilities not specifically addressed in the APD, the operator shall submit a Sundry Notice to the BLM Authorized Officer for approval.

13. If not already required prior to constructing and drilling the well location, the operator shall immediately upgrade the entire access road to BLM standards (including topsoiling, crowning, ditching, drainage culverts, surfacing, etc.) to ensure safe, environmentally-sound, year-round access.

14. Waterbars shall be installed on all reclaimed pipeline corridors per the guidelines in C.5.

E. General Information

1. Please contact (pertinent NRS), Natural Resource Specialist, @ (307) 684-1100, Bureau of Land Management, Buffalo, if there are any questions concerning the above surface use stipulations.

Appendix D
Mitigation Monitoring and Reporting Plan

Appendix D — Mitigation Monitoring and Reporting Plan

This Appendix outlines the planning process for the Mitigation Monitoring and Reporting Plan (MMRP) for the Powder River Basin Oil and Gas Project Area. This document describes the basic components of the plan and steps involved in its implementation.

The PRB Oil and Gas Project FEIS contains a detailed description of the nature of exploration and development of coal bed methane in the Powder River Basin. It is speculative to predict how future development will proceed. There is uncertainty about the specifics of future development. Because of this uncertainty, a number of assumptions were necessary to predict the impacts associated with future development. Those assumptions may or may not be correct. Therefore, mitigation measures may need to be modified as development evolves.

Purpose and Need

The effects of the proposed action on the environment as identified in this analysis are based on a series of assumptions. Because the development may not occur exactly as portrayed in this document, it will be important to monitor effects as development progresses over time. It will also be important to assess the effectiveness of the mitigation measures adopted. For instance, will adopted mitigation and best management practices be adequate to prevent water quality degradation in the Tongue, Powder and Little Powder Rivers? Will operating within decibel level thresholds be sufficient to protect grouse breeding integrity? These questions are particularly relevant given our current ability to predict cumulative perturbations on the ecosystem. Predictions regarding the severity of the impacts are complicated further by the fact that some of the development may occur on private and state lands where protective measures (such as seasonal restrictions to protect big game and raptor nests, no surface occupancy stipulations) are not typically applied. Will perturbations on private lands increase density on Federal lands resulting in deteriorating quality of habitat?

The uncertainties as to where and at what level development will proceed as well as uncertainties associated with the assumptions that were used to predict impacts suggest that the one-time determination of impacts that is included in the EIS may not occur as projected. A MMRP would help to continually assess the effects of the project and the adequacy of the mitigation. Such a plan/process would provide a mechanism for continuously modifying management practices in order to allow development while continuing to protect the environment. CEQ regulations provide for appropriate application of continual monitoring and assessment. Section 102(2)(B) of NEPA calls for *"methods ... which will insure that presently unquantified environmental amenities and values may be given appropriate consideration,"* CEQ regulations (40 CFR 1505.2(c); 1505.3(c) and (d)) state *"a monitoring and enforcement program would be adopted and summarized, where applicable, for any mitigation"* and that agencies *"may provide for monitoring to assure that their decisions are carried out and should do so in important cases."* The lead agency must *"upon request, inform cooperating* or *commenting agencies on progress in carrying out mitigation measures which they have proposed, and which were adopted in the decision." And, "upon request, make available to the public the results of relevant monitoring."*

Goals and Objectives

The goals and objectives of the MMRP are to develop resource-monitoring plans for specified resources to:

- Determine the effects of development on these resources;
- Determine the effectiveness of the mitigation measures contained in the Record of Decision (ROD);
- Modify the mitigation measures as deemed appropriate to achieve the stated goal/objective;
- Assure that non-oil-and-gas related BLM decisions (such as grazing, recreation, etc.) regarding, are coordinated with oil and gas-related development;
- Provide a rapid response to unnecessary/undue environmental change;
- Validate predictive models used in the EIS and revise the models/projections as necessary based on field observations and monitoring;
- Accurately monitor and predict cumulative impacts through BLM maintenance of a Geographic Information System (GIS) on Federal and non-Federal lands and how they are affecting resources;
- Provide guidance for monitoring (surveys) upon which the need to initiate Section 7 consultation with the USFWS will be determined.

Resource Monitoring Plans and Objectives

Monitoring Plans will be prepared for the following resources and activities. Determination of the on-the-ground monitoring will be made by the BLM and cooperating agencies that carry out the monitoring programs.

Wildlife Resource

Sage grouse/sharp-tailed grouse

1. Clearance surveys for sage grouse breeding activity would be documented in a database. Document changes, if any, in breeding distribution, associated with oil and gas development.
2. Loss of sagebrush shrublands and their reclamation success would be documented in a database. Weed infestation would also be documented so appropriate treatment can occur.

Raptors

1. Monitor and document raptor nesting activity and locations within the PRB.
2. Document changes, if any, in nesting locations, active nest sites, and effects from oil and gas development.

Threatened, Endangered, or Sensitive Species

1. A written summary will be provided to the USFWS' Wyoming Field Office semi-annually. The semi-annual report will include field survey reports for endangered, threatened, proposed and candidate species for all actions covered under the *Environmental Impact Statement (EIS) for the Powder River Basin Oil and Gas Project* and ROD. The semi-annual reports will include all actions completed up to 30 days prior to the reporting dates. The first report will be due 6 months after the signing of the ROD and on the anniversary date of the signing of the ROD. Reporting will continue for the life of the project.

Bald Eagle

1. A database would be maintained tracking bald eagle deaths or injuries encountered in the field related to this action.
2. Suitable nesting and winter roosting habitats inventoried would be identified and mapped.
3. All take of bald eagle habitat associated with implementation of the action would be documented.
4. A carcass monitoring program would be implemented.

Black-footed Ferret

1. Suitable black-footed ferret habitat would be identified and mapped.
2. All take of prairie dog habitat associated with implementation of the action would be documented.

Mountain Plover

1. All take of mountain plover habitat associated with implementation of the action would be documented.
2. A carcass monitoring program would be implemented.
3. The success of reclamation of areas of previously suitable mountain plover habitat would be monitored. Reclamation would be considered complete when ground cover with seeded species is similar to pre-disturbance percentages. Weed infestation would also be documented so appropriate treatment can occur.

Ute ladies'-tresses orchid

1. Suitable orchid habitat would be identified and mapped.
2. The success of reclamation of areas of previously suitable orchid habitat would be monitored. Reclamation would be considered complete when ground cover with seeded species is similar to pre-disturbance percentages.

Weed infestation would also be documented so appropriate treatment can occur.

Aquatics

1. Water quality in ponds developed for fisheries would be sampled on an annual basis for selenium, TDS, and sodium bicarbonate, at a minimum.
2. Stream channel monitoring for erosion, degradation, and riparian health would be conducted on an annual basis and after major storm events to determine the storm event's effects (non-CBM related effects). Surveys would include no less than one stream reach above all CBM discharges and several stream reaches below CBM discharges. Were monitoring occurs, a station would be placed above all CBM outfalls and one below all CBM outfalls, at least on main stems.
3. Sub-watersheds that will receive CBM produced waters and would be monitored for macroinvertebrates and fish populations include: Upper Tongue River, Upper Powder River, Salt Creek, Crazy Woman Creek, Clear Creek, Middle Powder River, Little Powder River, Antelope Creek, Upper Cheyenne River, and Upper Belle Fourche River. Sampling sites would be established at existing flow and water quality monitoring stations where possible. Monitoring of salinity by electric conductance in discharged water would be performed to assess the potential for adverse effects. Sampling would occur on an annual basis during low flow periods, and all data collected would be entered into a central database. At least two sampling locations per stream or river would be established in these watersheds.

Water

Groundwater

1. The effects of infiltrated waters on the water quality of existing shallow groundwater aquifers are not well documented at this time. Potential impacts will be highly variable depending on local geologic and hydrologic conditions. It may be necessary to conduct investigations at representative sites around the basin to quantify these impacts, and provide site-specific guidance on the placement and design of CBM related impoundments. Shallow ground water wells would be installed and monitored where necessary.
2. A battery of 35 groundwater monitoring well locations would be installed throughout the project area.

Surface Water

BLM, in cooperation with the WDEQ, WSEO, USGS and others fund an extensive network of surface water monitoring sites in the project area. Approximately 47 stations are currently operated to continuously record stream flow on major rivers and streams in the area. Over half of these sites include periodic water quality analysis as well. This analysis typically includes major cations and ions (calcium, magnesium, sodium, bicarbonate, chloride, and sulfate), selected nutrients (nitrate and phosphorus), and trace metals (arsenic, barium, ion, manganese, and selenium). The PAW also contracts water quality sampling at 26 sites on tributary streams in the region. Continued monitoring by BLM in conjunction with federal, state, and local agencies at existing sites on tributaries and mainstems in the Project Area would be incorporated into the monitoring plans described below.

All parties involved are currently developing a comprehensive, basin wide surface water-monitoring plan that will integrate the efforts of all cooperators into a single monitoring effort. All data from this monitoring network will be compiled at a single depository and will be available to all interested parties.

Discharges of CBM

Proposed CBM produced water discharges would initially be characterized in accordance with the requirements of WDEQ's NPDES general permit application. Once surface discharge is authorized, under a WDEQ-issued NPDES permit, initial monitoring of the discharge from each outfall would include Total Petroleum Hydrocarbons (TPH), pH, Specific Conductance (EC), Total Dissolved Solids (TDS), sulfate, chloride, Radium 226, Total Iron (Fe), Total Manganese (Mn), Total Barium (Ba), and Flow Volume. Following initial monitoring, routine monitoring at specified intervals would include flow (monthly), TPH, pH, EC (every 6 months), and Radium 226, Fe, Mn, Ba, Chloride (annually). During monthly flow monitoring, a visual inspection of erosion control measures would take place, to assure that no significant damage or erosion of the receiving water channel at the point of discharge has occurred. This monitoring describes the minimum requirements of WDEQ's general permit for CBM produced water discharges; additional or more stringent monitoring requirements may be imposed at the discretion of the WDEQ.

Bicarbonate is one constituent of interest that may require additional monitoring because of its potential toxicity to aquatic life. Discharges of CBM produced water are typically higher in sodium bicarbonate, which could have adverse effects on local populations of fish in selected drainages of the Project Area. The need for routine monitoring for bicarbonate would be evaluated during the NPDES permit process, based on the initial characterization of the CBM produced water discharge and aquatic resources specific to the drainage receiving the discharge.

If surface discharge of CBM produced water is proposed in receiving drainages where there are existing irrigation activities taking place, WDEQ permitting procedures may require operators to include an irrigation use protection plan with the NPDES permit application that specifies necessary measures to prevent violating the narrative standards for the protection of irrigated agriculture in the drainage. If the water quality of the proposed discharge is not of equal or better quality than the ambient quality of the main stem, operators would be required to demonstrate that a poorer water quality with respect to EC and SAR values would not result in a measureable reduction in crop yield and soil quality and permeability. In addition to initial characterization of the CBM produced water proposed for surface discharge (i.e. irrigation use), baseline soils monitoring that may be required to make this determination would include soil type, texture, and permeability, as well as analyses for SAR, EC, sodium (Na), calcium (Ca), magnesium (Mg), and exchangeable sodium percentage (ESP). Subsequent monitoring to guage changes in water and soil quality would include the list of analytes listed above, and would need to occur at monthly intervals during the irrigation season to facilitate adjustments before measurable decreases in crop productivity result.

Natural Springs

Before CBM development occurs, existing springs within ½ mile of the proposed development would be inventoried. Initial flow rates would be measured, and a water quality sample to be analyzed for the same list of constituents required by WDEQ's NPDES general permit application would be obtained. The springs would be re-sampled every spring and fall to monitor any changes in the quantity or quality as a result of CBM development. These subsequent samples would be analyzed for the same list of constituents required by the monitoring specified in the WDEQ-issued NPDES permit.

Impoundments

CBM produced water discharges to off-channel containment impoundments would be subject to the requirements of WDEQ's NPDES general permit for these structures. Routine monitoring at specified intervals at the end-of-pipe discharge to the impoundment would include flow and TPH (monthly), pH, EC, chloride, and Total Selenium (Se) (every 6 months), and Radium 226 (annually). During monthly monitoring, a visual inspection of the impoundment would take place, to assure that no significant seeps or springs has occurred. In addition to the discharge to the impoundment, monitoring for Total Se, EC, chloride, and sulfate in the water contained in the impoundment would be required every 6 months, to evaluate the effects of evaporation on the water quality in the impoundment. This monitoring describes the minimum requirements of WDEQ's general permit for CBM produced water discharges to off-channel containment impoundments; additional or more stringent monitoring requirements may be imposed at the discretion of the WDEQ.

Land Application Disposal Areas

Routine monitoring of the water quality and soils at LAD areas would need to occur to assure that adverse effects are not occurring, or if so, can be mitigated. Monitoring of the CBM produced water proposed for LAD would include analysis for SAR, EC, major cations (Ca, Mg, Na), pH, and bicarbonate on a monthly basis, and monthly soils monitoring including the above constituents in addition to ESP and cation exchange capacity (CEC). Soil samples would be taken from each soil profile, and, while the number of samples would be determined based on site-specific topography, climate, and soil conditions, approximately one sample for every 5 acres of LAD area would be included.

Wetlands/Riparian

1. Any disturbed wetlands and/or riparian areas would be documented and tracked in a database.
2. The success of reclamation of disturbed areas would be monitored. Reclamation would be considered complete when ground cover with seeded species is similar to pre-disturbance percentages. Weed infestation would also be documented so appropriate treatment can occur.

3. Similar to #3. in aquatics, monitoring of salinity, by electric conductance in discharged water, would be performed to assess the potential for adverse effects to riparian vegetation. For each POD where salinity of discharged water is likely to reach a stream or wetland, one or more monitoring stations would be installed to assess effects to vegetation.

Reclamation/Best Management Practices

Surface Disturbance Revegetation

1. Annually monitor disturbed site reclamation/revegetation success and invasive species occurrences.

Soils

1. Compile data related to LAD operation and mitigation to determine best management practices under various soil/water parameters.
2. BLM has installed 31 soil gas probes in 12 clusters. The probes are mainly in the Gillette area and the Thunder Basin National Grassland east of Wright. Probes have been installed in areas that may be potential conduits for methane to migrate to the surface, near the coal burn line where highly permeable clinker may allow gas to migrate, near drill holes or old wells to check for improper sealing, and near inactive mine faces and old mine fires.

   The scope of the program will probably remain at a low level unless an incident occurs that would warrant an expanded network. Gillette has also installed over 30 probes within the city limits and measures them on a quarterly basis.

Air Quality

1. An annual monitoring report would be completed of actual on-the-ground calculated potential NO, emissions (i.e., the level of NO., emission from permitted, actually constructed/installed facilities based upon the permitted level of emissions per well location, compressor facility, etc.) for a sample size of the project area.
2. Continue to cooperate in the implementation of existing visibility and atmospheric deposition impact monitoring programs.

   WDEQ detects changes in air quality through monitoring and maintains an extensive network of air quality monitors throughout the state. Particulate is most commonly measured as particles finer than 10 microns or PM_{10}. The eastern side of the Powder River Basin has one of the most extensive networks of monitors for PM_{10} in the nation due to the density of coal mines. In addition to the network associated with the mines, there are also monitors in Sheridan and Gillette, Wyoming. To better monitor particulate related to coal bed methane, Wyoming is currently installing monitors in Arvada and Wright, Wyoming.

WDEQ uses monitoring located throughout the state to anticipate issues related to air quality. These monitoring stations are located to measure ambient air and not located to measure impacts from a specific source. Monitors located to measure impacts from a specific source may also be used for trends. This data is used to pro-actively arrest or reverse trends towards air quality problems. When WDEQ became aware that particulate readings were increasing due to increased coal bed methane activity and exacerbated by prolonged drought, the DEQ approached the counties, coal mines and coal bed methane industry. A "coalition of the counties", coal companies and coal bed methane operators have made significant efforts towards minimizing dust from roads. Measures taken have ranged from the implementation of speed limits to paving of heavily traveled roads.

Monitoring is also used to measure compliance. Where monitoring shows a violation of any standard, the WDEQ can take a range of enforcement actions to remedy the situation. Where a standard is exceeded specific to an operation, the enforcement action is specific to the facility. For many facilities, neither the cause nor the solution are simple. The agency normally uses a negotiated settlement in those instances.

There are also monitors for nitrogen oxides (NO_x) in spread along the east side of the Basin. WDEQ has also sited two visibility monitoring stations in the Basin. One of these sites is 32 mi north of Gillette and includes a Nephelometer, a Transmissometer, an Aerosol Monitor (IMPROVE Protocol), instruments to measure meteorological parameters (temp., RH, wind speed, wind direction), a digital camera, instruments to measure Ozone and instruments to measure Oxides of Nitrogen (NO, NO_2, NO_x).

The other visibility monitoring station is located 14 miles west of Buffalo and includes a Nephelometer, a Transmissometer, an Aerosol Monitor (IMPROVE Protocol), instruments to measure meteorological parameters (temp., RH, wind speed, wind direction), and a digital camera.

Noise

Where compressors are built a distance of one-quarter mile from sensitive receptors, monitoring devices would be installed so that noise levels would not exceed 50 decibels above background noise.

Transportation

Access roads and sales pipelines

1. Monitor construction to ensure design and use standards are met and maintained.
2. GIS will be updated at least semi-annually based on companies' submittals of as built geo-referenced POD maps.

Mitigation, Monitoring and Reporting Planning Process Implementation

The BLM Buffalo Field Manager will implement the MMRP by establishing the *Powder River Basin Working Group* (PRBWG). The PRBWG will function as a resource working group consisting of BLM, cooperating agencies and other agencies who have expertise in the area. The structure of the PRBWG will be as follows:

The PRBWG may include representatives from the following federal and state agencies:

- Bureau of Land Management [Buffalo and Platte Field Offices and personnel with special expertise from other BLM offices]
- U.S. Fish and Wildlife Service
- U.S. Army Corps of Engineers
- USDA Forest Service
- State of Wyoming agencies [Wyoming Game and Fish Department, Wyoming Department of Transportation, Wyoming Department of Environmental Quality - Air and Water Quality Divisions, State Historic Preservation Office, State Engineers Office, Wyoming Oil and Gas Conservation Commission, etc.]
- U.S. Environmental Protection Agency
- Johnson, Sheridan, Campbell and Converse County government as outlined in the state cooperating agency agreement.

An MMRP will be initiated after the approval of the PRBO&G ROD. The primary function of the PRBWG will be to:

- Review the development and implementation of monitoring plans for the PRB oil and gas development;
- Meet at a minimum once a year or more often as needed;
- Keep written record of meetings and disseminate to members and interested public;
- Conduct field inspections as needed to review the implementation of construction and rehabilitation operations; Review status quo and any new information since last meeting (e.g., monitoring results of impact mitigation effectiveness);
- Synthesize monitoring plan activities/expectations for the coming year, based upon operator input and new information;
- Review recommendations from the Task Groups and submit a recommendation to BLM (e.g., management practices and monitoring needs for upcoming field season);
- Oversee implementation of monitoring.

The PRBWG may establish Task Groups. The individual Task Groups would be initiated as needed.

The BLM would implement and coordinate the MMRP Process. BLM would have the sole authority for decisions relative to this process. The leadership for the coordination will be located in the BLM Buffalo Field Office. Meetings of the PRBWG and TG's would be held at a minimum, annually. Minutes of the meetings would be made available to the public upon request.

Function of PRBWG at First Meeting:

Explain Purpose and Need for MMRP process;

- Explain organizational structure and functional responsibilities of PRBWG and TGs;
- Establish and select PRBWG representatives;
- Review draft Memorandum of Understanding;
- Establish and select TG members;
- Set date, time, and place for next PRBWG meeting.

Function of PRBWG at Subsequent Meetings:

- Review minutes from previous meeting;
- Reports presented from the TG's on monitoring results;
- Review recommendations from TG's;
- Develop any changes to mitigation measure recommendations if necessary;
- Submit recommendations and monitoring results to BLM;
- BLM specify any new directives, set date, time, and place for next PRBWG meeting.

Task Group Functions.

Separate resource or activity Task Groups (TG's) would be established if necessary to complete the following:

- Recommend implementation of specified resource/activity monitoring plans;
- Keep written record of meetings and disseminate to PRBWG members and interested public;
- Implementation protocol including proposed fund sources;
- Annual monitoring report needs and meeting frequency;
- Resource concerns (e.g., based upon current conditions, drilling plans, etc.)
- Preparation of the monitoring plan and for evaluation of monitoring results, review, evaluate and summarize past/present data pertaining to the resource;
- Annual survey/inventory, monitoring, etc. that needs to be completed;
- Evaluation of mitigation measure(s) effectiveness;
- Results of monitoring and evaluation of the effect of project development on the resource;
- Implement monitoring plan as approved by BLM.
- Review and evaluate monitoring data collected;

- Present and submit monitoring results annually to PRBWG;
- Review and evaluate current monitoring plan;
- Modify monitoring plan and implement as approved by BLM;
- Recommend modifications to the development and monitoring plan to the PRBWG and BLM;
- If necessary, recommend modification to mitigation as needed.

The TG leadership for the coordination among the group and for the development, implementation, and reporting results of the monitoring plans will be as determined by group members. Meetings of the TG's will be held as often as deemed necessary but at least annually. TG meetings will be held during work hours. The agenda will be developed by the TG leader to address the necessary items as defined under the TG Functions above.

MMRP Funding

The PRBWG will work with the O&G industry to implement the monitoring programs specified. Agencies and cooperators will work with industry in corporate funding of monitoring to the extent that budget allocations permit.

Appendix E
Project Area Soils Series Characteristics

Project Area Soil Series Characteristics

Map Unit	Major Soil Series	Surface Texture	Slope Range	Severe Wind Erosion Hazard	Severe Water Erosion Hazard	Severe Shrink-Swell Potential	Salinity	Prime Agricultural Soils	Poor Revegetation Potential
WY002	Midway	Silty Clay Loam	2-35 percent						
	Samday	Clay Loam	2-45 percent		X	X			X
	Rock Outcrop								X
WY004	Haverson	Loam	0-6 percent					X	
	Glenberg	Fine Sandy Loam	0-3 percent					X	
	Bone	Clay Loam	0-6 percent			X	X		
WY042	Cabbart	Loam	2-75 percent						X
	Yawdim	Silty Clay	2-70 percent		X	X			X
	Hesper	Silty Clay Loam	0-15 percent						
WY043	Ridge	Sandy Loam	4-65 percent				NR		
	Broadus	Loam	8-65 percent				NR		
	Reeder	Loam	2-25 percent						
WY044	Havre	Loam	0-6 percent						
	Hanly	Fine Sandy Loam	0-6 percent						
	Glendive	Loam	0-8 percent						
WY045	Cabbart	Loam	2-75 percent						X
	Yawdim	Silty Clay	2-70 percent		X	X			X
	Thurlow	Silty Clay Loam	0-15 percent						
WY046	Cabba	Silty Loam	15-50 percent		X*				X
	Ringling	Channery Loam	8-95 percent						X
	Yawdim	Silty Clay	2-70 percent		X	X			X
WY047	Draknab	Fine Sandy Loam	0-4 percent	X					
	Arvada	Clay Loam	0-6 percent			X			
	Bidman	Loam	0-15 percent			X			
WY048	Riverwash								
	Haverdad	Fine Sandy Loam	0-6 percent					X	
	Clarkelen	Loam	0-3 percent						
WY049	Shingle	Clay Loam	0-80 percent		X*				X
	Renohill	Clay Loam	3-25 percent		X*	X			
	Forkwood	Clay Loam	0-15 percent					X	
WY050	Shingle	Loam	10-40 percent		X*				X
	Taluce	Sandy Loam	15-40 percent						X
	Kishona	Loam	3-6 percent						
WY051	Wyarno	Clay Loam	0-9 percent			X			
	Hargreave	Fine	3-15 percent						

Map Unit	Major Soil Series	Surface Texture	Slope Range	Severe Wind Erosion Hazard	Severe Water Erosion Hazard	Severe Shrink-Swell Potential	Salinity	Prime Agricultural Soils	Poor Revegetation Potential
		Sandy Loam							
	Moskee	Fine Sandy Loam	0-45 percent		X*			X	
WY053	Shingle	Loam	2-60 percent		X*				X
	Cushman	Clay Loam	0-15 percent						
	Taluce	Fine Sandy Loam	3-30 percent						X
WY055	Haverdad	Fine Sandy Loam	0-6 percent					X	
	Havre	Loam	0-6 percent						
	Zigweid	Loam	0-15 percent					X	
WY056	Samday	Clay Loam	2-60 percent		X*	X			X
	Shingle	Loam	2-60 percent		X*				X
	Rock Outcrop								X
WY057	Doney	Silt Loam	6-90 percent		X*				X
	Shaak	Loam	0-6 percent			X			
	Wayden	Silty Clay	0-35 percent		X*	X			
WY058	Abac	Silt Loam	9-35 percent						X
	Peritsa	Silt Loam	9-35 percent						
	Rock Outcrop								X
WY059	Rock Outcrop								X
	Starley	Loam	10-60 percent						X
	Woosley	Loam	2-15 percent		X*				
WY060	Tolman	Channery Loam	5-70 percent						X
	Abac	Silt Loam	9-35 percent						X
	Rock Outcrop								X
WY061	Agneston	Coarse Sandy Loam	10-50 percent						X
	Rock Outcrop								X
	Granile	Coarse Sandy Loam	10-50 percent						
WY062	Owen Creek	Clay Loam	9-30 percent			X			
	Tongue River	Silty Loam	2-60 percent	X	X*		NR		
	Gateway	Loam	6-50 percent	X		X	NR		X
WY063	Wolf	Loam	0-3 percent						
	Platner	Clay Loam	0-25 percent			X			
	Platsher	Loam	0-3 percent			X			
WY064	Platsher	Loam	0-3 percent			X			
	Recluse	Loam	3-6 percent					X	
	Parmleed	Sandy Loam	3-9 percent			X			
WY065	Baux	Loam	3-60 percent		X*				X
	Bauxson	Channery Loam	3-60 percent		X*				X
	Harlan	Loam	0-15 percent		X*			X	
WY066	Moskee	Fine Sandy Loam	0-45 percent		X*			X	
	Hargreave	Fine	3-15 percent						

Map Unit	Major Soil Series	Surface Texture	Slope Range	Severe Wind Erosion Hazard	Severe Water Erosion Hazard	Severe Shrink-Swell Potential	Salinity	Prime Agricultural Soils	Poor Revegetation Potential
		Sandy Loam							
	Shingle	Loam	2-60 percent		X*				X
WY078	Frisco	Sandy Loam	2-70 percent				NR		
	Troutville	Coarse Sandy Loam	2-60 percent				NR		X
	Teewinot	Gravelly Loam	5-70 percent	X			NR		X
WY081	Barnum	Fine Sandy Loam	0-3 percent					X	
	Haverdad	Loam	0-3 percent					X	
	Rock Outcrop								X
WY082	Renohill	Clay Loam	3-12 percent			X			
	Shingle	Loam	3-45 percent						X
	Parmleed	Sandy Loam	3-9 percent			X			
WY084	Keyner	Sandy Loam	0-6 percent				X		
	Samday	Clay Loam	3-12 percent			X			X
	Rock Outcrop								X
WY085	Samday	Clay Loam	3-12 percent			X			X
	Badland								X
	Rock Outcrop								X
WY086	Cambria	Fine Sandy Loam	2-15 percent						
	Shingle	Loam	3-45 percent						X
	Kishona	Loam	10-30 percent						
WY087	Shingle	Loam	3-45 percent						X
	Cambria	Fine Sandy Loam	2-15 percent						
	Renohill	Clay Loam	3-12 percent			X			
WY088	Sunup	Gravelly Loam	10-30 percent						X
	Rock Outcrop								X
	Spearfish	Fine Sandy Loam	10-30 percent						X
WY114	Tassel	Fine Sandy Loam	2-30 percent						X
	Turnercrest	Sandy Loam	6-30 percent						
	Terro	Sandy Loam	2-10 percent						
WY115	Shingle	Loam	6-30 percent						X
	Samday	Clay Loam	2-45 percent		X*	X			X
	Absted	Fine Sandy Loam	0-6 percent			X	X		
WY124	Platsher	Loam	0-9 percent			X			
	Kishona	Loam	0-15 percent						
	Hiland	Sandy	3-15 percent	X				X	

Map Unit	Major Soil Series	Surface Texture	Slope Range	Severe Wind Erosion Hazard	Severe Water Erosion Hazard	Severe Shrink-Swell Potential	Salinity	Prime Agricultural Soils	Poor Revegetation Potential
		Loam							
WY125	Shingle	Clay Loam	0-75 percent						X
	Theedle	Loam	3-40 percent						
	Wibaux	Gravelly Loam	0-75 percent						X
WY126	Hiland	Sandy Loam	0-15 percent	X				X	
	Vonalee	Sandy Loam	0-15 percent	X					
	Maysdorf	Sandy Loam	0-15 percent						
WY127	Kishona	Loam	0-15 percent						
	Shingle	Clay Loam	0-75 percent						X
	Theedle	Loam	3-40 percent						
WY128	Renohill	Clay Loam	3-15 percent			X			
	Cushman	Loam	0-15 percent						
	Cambria	Loam	0-9 percent						
WY129	Bidman	Loam	0-9 percent			X			
	Parmleed	Loam	3-15 percent			X			
	Renohill	Clay Loam	3-15 percent			X			
WY130	Renohill	Clay Loam	3-15 percent			X			
	Bidman	Loam	0-6 percent			X			
	Ulm	Clay Loam	0-6 percent			X		X	
WY204	Hiland	Sandy Clay Loam	0-15 percent					X	
	Ustic Torriorthents	Loamy Sand	3-30 percent						
	Bowbac	Sandy Loam	0-15 percent						
WY203	Clarkelen	Sandy Loam	0-3 percent						
	Draknab	Loamy Sand	0-3 percent	X					
	Haverdad	Fine Sandy Loam	0-3 percent					X	
WY205	Dwyer	Loamy Sand	0-15 percent	X					X
	Orpha	Loamy Sand	0-15 percent	X					
	Hiland	Sandy Clay Loam	0-15 percent					X	
WY206	Wibaux	Channery Loam	0-45 percent						X
	Rock Outcrop								X
	Shingle	Clay Loam	3-45 percent		X*				X
WY207	Hiland	Sandy Clay Loam	0-15 percent					X	
	Bowbac	Sandy Loam	0-15 percent	X					
	Tassel	Fine Sandy	10-30 percent	X					X

Map Unit	Major Soil Series	Surface Texture	Slope Range	Severe Wind Erosion Hazard	Severe Water Erosion Hazard	Severe Shrink-Swell Potential	Salinity	Prime Agricultural Soils	Poor Revegetation Potential
		Loam							
WY208	Shingle	Clay Loam	3-45 percent		X*				X
	Samday	Clay Loam	3-30 percent			X			X
	Hiland	Sandy Clay Loam	0-15 percent					X	
WY209	Hiland	Sandy Clay Loam	0-15 percent					X	
	Shingle	Clay Loam	3-45 percent		X*				X
	Tassel	Fine Sandy Loam	10-30 percent	X					X
WY210	Ulm	Loam	0-15 percent			X		X	
	Renohill	Fine Sandy Loam	0-15 percent			X			
	Shingle	Clay Loam	3-45 percent		X*				X
WY211	Shingle	Clay Loam	3-45 percent		X*				X
	Tassel	Fine Sandy Loam	10-30 percent	X					X
	Rock Outcrop								X
WY315	Rock Outcrop								X
	Hazton	Gravelly Sandy Loam	10-40 percent						X
	Redsun	Channery Loam	3-30 percent						X
WY316	Hiland	Sandy Loam	0-15 percent	X				X	
	Bowbac	Loamy Fine Sand	3-15 percent						
	Keyner	Sandy Clay Loam	0-12 percent				X		
WY317	Shingle	Loam	3-45 percent		X*				X
	Taluce	Sandy Loam	6-40 percent						X
	Amodac	Fine Sandy Loam	2-12 percent				X		
WY321	Hiland	Sandy Loam	0-15 percent	X				X	
	Orpha	Loamy Sand	3-45 percent	X					
	Bowbac	Loamy Fine Sand	3-15 percent						
WY322	Roughlock	Loam	0-15 percent						
	Rock Outcrop								X
	Rekop	Loam	5-40 percent						X
WY323	Lolite	Clay	5-50 percent		X	X			X
	Hiland	Sandy Loam	0-15 percent	X				X	
	Vonalee	Loamy	3-15 percent	X					

Map Unit	Major Soil Series	Surface Texture	Slope Range	Severe Wind Erosion Hazard	Severe Water Erosion Hazard	Severe Shrink-Swell Potential	Salinity	Prime Agricultural Soils	Poor Revegetation Potential
		Sand							
WY324	Hiland	Sandy Loam	0-15 percent	X				X	
	Forkwood	Loam	0-12 percent					X	
	Zigweid	Loam	2-15 percent					X	
WY325	Lolite	Clay	5-50 percent		X	X			X
	Rock Outcrop								X
	Keyner	Sandy Clay Loam	0-12 percent				X		

Appendix F
Air Quality

Appendix F — Air Quality

Air Quality Impact Technical Support Document

The following technical support document describes the processes used to conduct the air quality impact assessment, and provides summaries of relevant analysis data:

Argonne National Laboratory.

2002. Technical Support Document - Air Quality Impact Assessment for the Montana Final Statewide Oil and Gas EIS and Proposed Amendment of the Powder River and Billings Resource Management Plans and the Wyoming Final EIS and Planning Amendment for the Powder River Basin Oil and Gas Development Project. Prepared for the U.S. Department of the Interior, Bureau of Land Management, Montana and Wyoming State Offices, by the Environmental Assessment Division, Argonne National Laboratory. Argonne, Illinois.

Copies of this technical support document are available upon request from:

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Introduction

Air pollution impacts are limited by local, state, tribal and federal air quality regulations, standards, and implementation plans established under the CAA and administered by the WDEQ-AQD and the EPA. Although not applicable to the proposed Alternatives, the MTDEQ-AWM has similar jurisdiction over potential air pollutant emission sources in Montana, which can have a cumulative impact with WDEQ-AQD approved sources. Air quality regulations require certain proposed new, or modified existing, air pollutant emission sources (including CBM compression facilities) undergo a permitting review before their construction can begin. Therefore, the applicable air quality regulatory agencies have the primary authority and responsibility to review permit applications and to require emission permits, fees and control devices, prior to construction and/or operation.

Fugitive dust and exhaust from construction activities, along with air pollutants emitted during operation (i.e., well operations, booster [field] and pipeline [sales] compressor engines, etc.), are potential causes of air quality impacts. These issues are more likely to generate public concern where natural gas development activities occur near residential areas. The FS, NPS and the FWS have also expressed concerns regarding potential atmospheric deposition (acid rain) and visibility impacts within distant downwind PSD Class I and PSD Class II sensitive areas under their administration, located throughout Wyoming, Montana, southwestern North Dakota, western South Dakota, and northwestern Nebraska.

Existing Air Quality

As described in **Chapter 3 — Affected Environment (Air Quality)**, specific air quality monitoring is not conducted throughout most of the Project Area, but air quality conditions are likely to be very good, as characterized by limited air pollution emission sources (few industrial facilities and residential emissions in the relatively small communities and isolated ranches) and good atmospheric dispersion conditions, resulting in relatively low air pollutant concentrations. As part of the Air Quality Impact Assessment prepared by Argonne National Laboratory (Argonne 2002), monitoring data measured throughout northeastern Wyoming and southeastern Montana were assembled and reviewed. Although monitoring is primarily conducted in urban or industrial areas, the data selected are considered to be the best available representation of background air pollutant concentrations throughout the Project Area. Specific values presented in Table AQ-1 were used to define background conditions in the air quality impact analysis. The assumed background pollutant concentrations are below applicable ambient air quality standards for all pollutants and averaging times. These National and Wyoming standards, and PSD increment values, are also presented in Table AQ-1.

Regulatory Framework

The NAAQS and WAAQS set the absolute upper limits for specific air pollutant concentrations at all locations where the public has access. The analysis of the proposed Alternatives must demonstrate continued compliance with all applicable local, state, tribal and federal air quality standards. Existing air quality throughout most of the Project Area is in attainment with all ambient air quality standards, as demonstrated by the relatively low concentration levels presented in Table AQ-1. However, four areas have been designated as federal nonattainment areas where the applicable standards have been violated in the past: Sheridan, Wyoming (PM_{10} - moderate); and Billings (CO), Lame Deer (PM_{10} - moderate) and Laurel (SO_2 - primary), Montana. EPA Region 8 staff are concerned that PM_{10} monitoring data collected near and south of Gillette, Wyoming, have also exceeded both the NAAQS and the available PSD Class II increment. Specific monitoring data are presented in Tables AQ-2 and AQ-3.

Table AQ-1 Assumed Background Concentrations, Applicable Ambient Air Quality Standards, and PSD Increment Values (in $\mu g/m^3$)

Pollutant	Averaging Time[a]	Background Concentration	National Ambient Air Quality Standards	Wyoming Ambient Air Quality Standards	PSD Class I Increment	PSD Class II Increment
carbon monoxide	1-hour	3,500[b]	40,000	40,000	---	---
	8-hours	1,500[b]	10,000	10,000	---	---
lead	Quarterly	n/a	1.5	1.5	---	---
nitrogen dioxide	Annual	16.5[c]	100	100	2.5	25
ozone	1-hour	82[d]	235	235	---	---
	8-hours	130[d]	157	157	---	---
$PM_{2.5}$	24-hours	19[f]	65	65	---	---
	Annual	7.6[f]	15	15	---	---
PM_{10}	24-hours	42[f]	150	150	8	30
	Annual	17[f]	50	50	4	17
sulfur dioxide	3-hours	8[e]	1,300	1,300	25	512
	24-hours	8[e]	365	260	5	91
	Annual	3[e]	80	60	2	20

Source: Argonne (2002)

Notes:

$\mu g/m^3$ - micrograms per cubic meter

[a] Annual standards are not to be exceeded; short-term standards are not to be exceeded more than once per year.

[b] Riley Ridge EIS (BLM 1983)

[c] Data collected in Gillette, Wyoming (1996 – 1997

[d] Data collected in Pinedale, Wyoming (1992 – 1994)

[e] Data collected at Devil's Tower (1983)

[f] Data collected in Gillette, Wyoming (1999)

n/a - data not available

Air quality regulations require certain proposed new, or modified existing, air pollutant emission sources (including CBM compression facilities) undergo a permitting review before their construction can begin. Therefore, the applicable air quality regulatory agencies have the primary authority and responsibility to review permit applications and to require emission permits, fees and control devices, prior to construction and/or operation. In addition, the U.S. Congress (through the CAA Section 116) authorized local, state and tribal air quality regulatory agencies to establish air pollution control requirements more (but not less) stringent than federal requirements. Also, under both FLPMA and the CAA, BLM can not authorize any activity which would not conform to all applicable local, state, tribal and federal air quality laws, regulations, standards, and implementation plans.

Table AQ-2 Annual Average PM$_{10}$ Monitoring Data Collected Near and South of Gillette, Wyoming (in μg/m^3)

Location	Station Number	1996	1997	1998	1999	2000	2001	2002 [a]
Rochelle R0-1	869	n/a	n/a	[15.3]	24.2	20.2	22.6	[25] [b]
North Rochelle E	874	n/a	n/a	n/a	[40] [b]	[51] [b]	[50] [b]	[35] [b]
Black Thunder BTM 26-2	877	21.0	17.7	23.2	33.4	30.9	25.6	[30] [b]
Antelope Site 4	881	n/a	14.5	13.4	16.2	16.7	19.8	[12] [b]
Triton Coal / Buckskin Mine	884	11.5	12.6	12.1	12.0	17.6*	18.3	[16] [b]
Cordero Hv-2	885	14.3	15.3	15.1	14.5	26.0*	24.3*	[30] [b]
Cordero Hv-3	889	11.9	10.9	10.4	9.7	17.1	19.8	[14] [b]
Coal Creek Ccm 26	890	9.0	7.9	8.6	8.5	8.3	[2.0]	n/a
Thunder Basin Coal / BTM	891	13.8	12.0	14.4	17 [b]	24.5	37 [b]	[57] [b]
Belle Ayr Ba-4, 5n, 5s	892	15.5	14.6	14.2	15.0	20.1	25 [b]	[20] [b]
Jacob Ranch Site 4	894	28.3	24.3*	25.1*	35.4*	35.9*	30.6*	n/a
Dry Fork Coal Co	896	13.8	13.0	10.5	9.3	10.8	13.2	[13] [b]
Triton Coal / Gillette	899	21.5	22.7	15.3	17.2	19.0*	21.0	[18] [b]
AMAX Eagle Butte Eb-5	900	12.5	10.6	11.6	11.7	15.0	15 [b]	[15] [b]
Jacob Ranch Site 5	905	15.0	14.6	15.1	20.5	21.3	31.7	n/a
North Rochelle 1	907	n/a	20.6	18.4	38.6	46.8	**50.8**	[52] [b]
Black Thunder BTM 36-1	915	n/a	n/a	n/a	n/a	[18] [b]	26 [b]	[16] [b]
Gillette, Wyoming	1002	16.1	16.7	17.6*	19.1*	20.7*	19.9*	[17] [b]

Source: EPA (2002b)

Notes:

[a] Incomplete data year; values reported through July 1, 2002.

[b] Supplemental data provided by (Payton 2002).

μg/m^3 - micrograms per cubic meter.

n/a - data not available.

[data] - data in brackets are not reliable due to the small number of samples collected.

data* - starred data are combined from two or more samplers operating at the same location during the same year.

Table AQ-3 Second Maximum 24-hour Average PM$_{10}$ Monitoring Data Collected Near and South of Gillette, Wyoming (in μg/m^3)

Location	Station Number	1996	1997	1998	1999	2000	2001	2002 [a]
Rochelle R0-1	869	n/a	n/a	[23]	62	46	63	[55] [b]
North Rochelle E	874	n/a	n/a	122	143	**156** [b]	[124] [b]	
Black Thunder BTM 26-2	877	66	44	55	125	123	101	[62] [b]
Antelope Site 4	881	n/a	32	32	35	50	54	[25] [b]
Triton Coal / Buckskin Mine	884	31	34	36	36	53*	73 [b]	[43] [b]
Cordero Hv-2	885	32	36	42	36	73*	65*	[55] [b]
Cordero Hv-3	889	30	22	25	26	46	47	[40] [b]
Coal Creek Ccm 26	890	20	16	23	25	31	n/a	n/a
Thunder Basin Coal / BTM	891	34	26	39	43 [b]	80	97 [b]	[155] [b]
Belle Ayr Ba-4, 5n, 5s	892	39	34	53	56	48	70 [b]	[35] [b]
Jacob Ranch Site 4	894	101	62*	54*	103*	88*	119 [b]	n/a
Dry Fork Coal Co	896	34	39	35	22	32	42	[34] [b]
Triton Coal / Gillette	899	85	65	37	45	54*	80 [b]	[73] [b]
AMAX Eagle Butte Eb-5	900	30	37	37	51	48	61	[36] [b]
Jacob Ranch Site 5	905	44 [b]	39	43	47	50	97	n/a
North Rochelle 1	907	n/a	39	49	100	125	**268** [b]	[211] [b]
Black Thunder BTM 36-1	915	n/a	n/a	n/a	n/a	[24]	76 [b]	[31] [b]
Gillette, Wyoming	1002	46 [b]	29	36*	42*	60*	43 [b]	[35] [b]

Source: EPA (2002b)

Notes:

[a] Incomplete data year; values reported through July 1, 2002.

[b] Supplemental data provided by (Payton 2002).

μg/m^3 - micrograms per cubic meter.

n/a - data not available.

[data] - data in brackets are not reliable due to the small number of samples collected.

data* - starred data are combined from two or more samplers operating at the same location during the same year.

Given most the Project Area's current attainment status, future development projects which have the potential to emit more than 250 tons per year of any criteria pollutant (or certain listed sources that have the potential to emit more than 100 tons per year) would be required to undergo a site-specific regulatory PSD Increment Consumption analysis under the federal New Source Review permitting regulations. Development projects subject to the PSD regulations may also be required by the applicable air quality regulatory agencies to incorporate additional emission control measures (including a BACT analysis and determination) to ensure protection of air quality resources, and demonstrate that the combined impacts of all PSD sources will not exceed the allowable incremental air quality impacts for NO_2, PM_{10}, and SO_2.

A regulatory PSD Increment Consumption analysis may be conducted as part of a New Source Review, or independently. The determination of PSD increment consumption is a legal responsibility of the applicable air quality regulatory agencies, with EPA oversight. In addition, an analysis of cumulative impacts due to all existing sources and the permit applicant's sources is also required during New Source Review to demonstrate that applicable ambient air quality standards will be met during the operational lifetime of the permit applicant's operations.

Sources subject to the PSD permit review procedure are also required to demonstrate potential impacts to AQRVs. These include visibility impacts, degradation of mountain lakes from atmospheric deposition (acid rain), and effects on sensitive flora and fauna in the Class I areas. The CAA also provides specific visibility protection procedures for the mandatory federal Class I areas designated by the U.S. Congress on August 7, 1977, which included wilderness areas greater than 5,000 acres in size, as well as national parks and national memorial parks greater than 6,000 acres in size as of that date. The Fort Peck and Northern Cheyenne tribes have also designated their lands as PSD Class I, although the national visibility regulations do not apply in these areas. The allowable incremental impacts for NO_2, PM_{10}, and SO_2 within these PSD Class I areas are very limited. The remainder of the Project Area is designated PSD Class II with less stringent requirements.

Agency Roles and Authorities

EPA

The Environmental Protection Agency (EPA) administers the Federal Clean Air Act (CAA), (42 U.S.C. 7401 et seq.) to maintain the National Ambient Air Quality Standards (NAAQS) that protect human health and to preserve the rural air quality in the region by assuring the Prevention of Significant Deterioration Class I and Class II increments for SO_2, NO_2, and PM_{10}, are not exceeded. EPA has delegated this CAA authority to the States of Montana and Wyoming.

Until the Tribes have an EPA-approved Tribal program, EPA will administer air quality requirements within Indian country. EPA is responsible for assuring that NAAQS are attained and that the Tribally-designated Northern Cheyenne Class I sensitive airshed is protected, as well as the Class II increment limits that apply on the Crow Reservation. EPA will implement an air permitting program for major sources within Indian country, including BACT analysis, where appropriate. At this time, there is no federal minor source permitting program. Therefore, EPA cannot regulate minor sources in Indian country directly unless EPA, based on the results of a PSD increment consumption model, decides to implement a Federal Implementation Plan (FIP). Based on future regulatory modeling in cooperation with MDEQ, EPA and BIA may require either Tribe to apply BACM to unimproved roads in Indian country or other control measures sufficient to avoid exceeding the Class I and Class II increment limits for PM_{10}.

Wyoming DEQ

Wyoming regulates pollutants emitted into the air through the Wyoming Environmental Quality Act (W.S. 35-11-101 et. seq.). Wyoming is also authorized by an approved State Implementation Plan (SIP) to administer all requirements of the Prevention of Significant Deterioration (PSD) permit program under the Clean Air Act. Additionally, the approved Wyoming SIP contains a number of programs which provide for the implementation, maintenance, and enforcement of the National Ambient Air Quality Standards, including a New Source Review program for minor source permitting which requires, among other things, application of Best Available Control Technology (BACT) for all new or modified sources regardless of size or source category. Included as well are authorities for the control of particulate emissions, including fugitive particulate emissions from haul roads, access roads, or general facility boundaries. Wyoming is also delegated responsibility to operate an approved ambient air quality monitoring network for the purpose of demonstrating compliance with the National and Wyoming Ambient Air Quality Standards.

Bureau of Land Management

NEPA .requires that federal agencies consider mitigation of direct and cumulative impacts during their preparation of an EIS (BLM Land Use Planning Manual 1601). Under the CAA, federal agencies are to comply with State Implementation Plans regarding the control and abatement of air pollution. Prior to approval of RMPs or Amendments to RMPs, the State Director is to submit any known inconsistencies with SIPs to the Governor of that state. If the Governor of the State recommends changes in the proposed RMP or Amendment to meet SIP requirements, the State Director shall provide the public an opportunity to comment on those recommendations. (BLM Land Use Planning Manual at Section 1610.3-2.)

Forest Service

The Forest Service administers nine (9) wilderness areas (WAs) that could be affected by direct effects associated with the project: Bridger WA; Fitzpatrick WA; North Absaroka, Absaroka-Beartooth, and Washakie WAs, next to Yellowstone NP; Teton WA; U.L. Bend WA; Cloud Peak WA; and Popo Agie WA with mandatory Class I designation. As federal land mangers, the Forest Service could act in a consultative role to stipulate that the BLM modeling results, or any future EPA or State-administered PSD refined modeling results (if justified), triggers adverse impairment status. Should the Forest Service determine impairment of WAs, then BLM, the State, and/or EPA may need to mitigate this predicted adverse air quality effect.

National Park Service

Three areas administered by the National Park Service– Yellowstone National Park, Devils Tower National Monument, and Bighorn Canyon National Recreation Area– could be affected by direct effects associated with the project. As federal land mangers, the Park Service could act in a consultative role to stipulate that the BLM modeling results, or any future EPA or State-administered PSD refined modeling results (if justified), triggers adverse impairment status. Should the Park Service determine impairment of NPS-administered Class I areas, then BLM, the State, and/or EPA may need to mitigate this predicted adverse air quality effect.

Air Quality Impact Assessment

As described in **Chapter 4 - Environmental Consequences (Air Quality)**, an extensive air quality impact assessment technical support document was prepared by Argonne National Laboratory (Argonne 2002) and is available for review. Argonne analyzed potential impacts from: individual proposed Alternatives 1, 2A, 2B, and 3; “Other” (non-Alternative) emission sources; and all sources cumulatively by Alternative. Alternatives 1, 2A and 2B have similar emission inventories, except half of the booster (field) compressors would be electrified under Alternative 2A, and all of the booster (field) compressors would be electrified under Alternative 2B.

The air quality impact assessment was based on the best available engineering data and assumptions, meteorology data, and dispersion modeling procedures, as well as professional and scientific judgment. However, where specific data or procedures were not available, reasonable assumptions were incorporated. For example, the air quality impact assessment assumed that the maximum CBM, conventional oil, coal and other development would occur simultaneously, whereas actual development would occur under different time schedules.

Potential air pollutant emissions from the proposed Alternative’s emission sources were combined with other (non-Alternative) sources to determine the total potential cumulative air quality impacts. These other (non-Alternative) sources included development associated with emission sources permitted: 1) by the WDEQ-AQD; 2) by the MTDEQ-AWM; and 3) within the states of North Dakota, South Dakota and Nebraska; plus 4) the Final Statewide Oil and Gas EIS and Proposed Amendment of the Powder River and Billings Resource Management Plans Alternative sources (BLM 2002).

Potential direct, indirect and cumulative air quality impacts from the Proposed Action, Alternatives, and other (non-Alternative) sources were analyzed and reported solely under the requirements of NEPA, in order to assess and disclose reasonably foreseeable impacts to both the public and the BLM decision maker before a Record of Decision is issued. Due to the preliminary nature of this

NEPA analysis, it should be considered an estimate of predicted impacts. Actual impacts at the time of development (subject to air pollutant emission source permitting) are likely to be different.

Given the lack of representative wind measurements throughout the CBM emphasis area, the EPA CALPUFF dispersion model was used with regional wind speed and direction values derived from the 1996 MM5 (mesoscale model) and CALMET meteorological models (Argonne 2002). Meteorological information was assembled to characterize atmospheric transport and dispersion from several 1996 data sources, including: 36 km gridded MM5 (mesoscale model) values with continuous four-dimensional data assimilation; and hourly surface observations (wind speed, wind direction, temperature, cloud cover, ceiling height, surface pressure, relative humidity, and precipitation.)

Potential air quality impacts were predicted using the EPA CALPUFF dispersion model. The meteorology data and air pollutant emission values were combined to predict maximum potential direct, indirect, and cumulative near-field air quality impacts in the vicinity of assumed well and compressor engine emission sources for comparison with applicable air quality standards and PSD Class II increments. Maximum potential near-field particulate matter emissions from traffic on unpaved roads and during well pad construction were used to predict the maximum annual and 24-hour average $PM_{2.5}$, PM_{10}, and SO_2 impacts. Maximum air pollutant emissions from each CBM well would be temporary (i.e., occurring during a 12-day construction period) and would occur in isolation, without significantly interacting with adjacent well locations. Particulate matter emissions from well pad and resource road construction would be minimized by application of water and/or chemical dust suppressants. The control efficiency of these dust suppressants was computed at 50 percent during construction. During well completion testing, natural gas could be burned (flared) up to 24 hours.

Air pollutant dispersion modeling was also performed to quantify CO, NO_2, $PM_{2.5}$, PM_{10}, and HAP impacts during operation. Operation emissions would primarily occur due to increased compression requirements, including booster (field) and pipeline (sales) compressor stations. Since produced natural gas is nearly pure methane, with little or no liquid hydrocarbons or sulfur compounds, direct VOC emissions or objectionable odors are not likely to occur. HAP impacts were predicted based on an assumed 9,900 horsepower, six-unit, reciprocating compressor engine station operating at full load with emissions generated by a single stack.

The significance criteria for potential air quality impacts include local, state, tribal and federally enforced legal requirements to ensure air pollutant concentrations will remain within specific allowable levels. These requirements and legal limits were presented in Table AQ-1. Where legal limits have not been established, BLM uses the best available scientific information to identify thresholds of significant adverse impacts. Thresholds have been identified for HAP exposure, potential ANC changes to sensitive lake water chemistry, and a 1.0 dv "just noticeable change" in potential visibility impacts.

Since neither the WDEQ-AQD nor EPA have established HAP standards, predicted 8-hour HAP concentrations were compared to a range of 8-hour state maximum Acceptable Ambient Concentration Levels (EPA 1997a). Pollutants which were predicted to exceed these state threshold levels were also analyzed to determine the possible incremental cancer-risk for a most likely exposure (MLE) to residents, and to a maximally exposed individual (MEI), such as compressor station workers. These cancer risks were calculated based on the maximum predicted annual concentrations, EPA's unit risk factors for carcinogenic compounds (EPA, 1997b), and an adjustment for time spent at home or on the job.

The EPA CALPUFF dispersion model was also used to determine maximum far-field ambient air quality impacts at downwind mandatory federal PSD Class I areas, and other sensitive receptors, to: 1) determine if the PSD Class I increments might be exceeded; 2) calculate potential total sulfur and nitrogen deposition, and their related impacts to in sensitive lakes; and 3) predict potential visibility impacts (regional haze) within distant sensitive receptors.

Several lakes within five FS designated wilderness areas were identified as being sensitive to atmospheric deposition and for which the most recent and complete data have been collected. The FS (Fox et al. 1989) has identified the following total deposition (wet plus dry) thresholds below which no adverse impacts are likely: five kg/ha-yr for sulfur, and three kg/ha-yr for nitrogen. The FS (2000) has also developed a screening method which identifies the following Limit of Acceptable Change regarding potential changes in lake chemistry: no more than a ten percent change in ANC for those water bodies where the existing ANC is at or above 25 μeq/l and no more than a one μeq/l change for those extremely sensitive water bodies where the existing ANC is below 25 μeq/l. No sensitive lakes were identified by either the NPS or FWS.

Since the potential air pollutant emission sources constitute many small sources spread out over a very large area, discrete visible plumes are not likely to impact the distant sensitive areas, but the potential for cumulative visibility impacts (increased regional haze) is a concern. Regional haze degradation is caused by fine particles and gases scattering and absorbing light. Potential changes to regional haze are calculated in terms of a perceptible "just noticeable change" (1.0 dv) in visibility when compared to background conditions. A 1.0 dv change is considered potentially significant in mandatory federal PSD Class I areas as described in the EPA Regional Haze Regulations (40 CFR 51.300 et seq.), and as originally presented in Pitchford and Malm (1994). A 1.0 dv change is defined as about a ten percent change in the extinction coefficient (corresponding to a two to five percent change in contrast, for a black target against a clear sky, at the most optically sensitive distance from an observer), which is a small but noticeable change in haziness under most circumstances when viewing scenes in mandatory federal Class I areas.

It should be noted that a 1.0 dv change is not a "just noticeable change" in all cases for all scenes. Visibility changes less than 1.0 dv are likely to be perceptible in some cases, especially where the scene being viewed is highly sensitive to small amounts of pollution, such as due to preferential forward light scattering. Under other view-specific conditions, such as where the sight path to a scenic feature is less than the maximum visual range, a change greater than 1.0 dv might be required to be a "just noticeable change." However, this NEPA analysis is not designed to predict specific visibility impacts for specific views in specific mandatory federal Class I areas based on specific project designs, but to characterize reasonably foreseeable visibility conditions that are representative of a fairly broad geographic region, based on emission source assumptions. This approach is consistent with both the nature of regional haze and the requirements of NEPA. At the time of a pre-construction air quality PSD permit review, the applicable air quality regulatory agency may require a much more detailed visibility impact analysis. Factors such as the magnitude of change, frequency, time of the year, and the meteorological conditions during times when predicted visibility impacts are above the 1.0 dv threshold (as well as inherent conservatism in the modeling analyses) should all be considered when assessing the significance of predicted impacts.

The FS, NPS and FWS have published their "Final FLAG Phase I Report" (Federal Register, Vol. 66 No. 2, dated January 3, 2001), providing "a consistent and predictable process for assessing the impacts of new and existing sources on AQRVs" including visibility. For example, the FLAG report states "A cumulative effects analysis of new growth (defined as all PSD increment-consuming sources) on visibility impairment should be performed," and further, "If the visibility impairment from the proposed action, in combination with cumulative new source growth, is less than a change in extinction of 10% [1.0 dv] for all time periods, the FLMs will not likely object to the proposed action."

The FLAG report also recommends a two-step analysis process to evaluate potential visibility impacts from either a single proposed air pollutant emission source (the seasonal FLAG screening method) or potential cumulative visibility impacts from a group of air pollutant emission sources (the daily FLAG refined method). As described in Argonne (2002), this NEPA analysis first used the seasonal FLAG "natural background" screening method (based on both the FLAG and WDEQ-AQD reference levels) to exclude those sensitive areas where visibility impacts were not likely to occur. Since no areas were excluded using the seasonal FLAG screening method, this NEPA analysis then applied the daily FLAG refined method (based on hourly background optical extinction and relative humidity values measured in both the Badlands and Bridger wilderness areas between 1989 and 1999) to determine the average number of days a 1.0 dv "just noticeable change" would be reached annually in each sensitive area. Although the use of observed hourly optical extinction and relative humidity values is appropriate in this NEPA analysis (where the potential visibility impacts are predicted to occur under the Proposed Action and Alternatives based on the reasonably foreseeable background conditions), EPA's Regional Haze Regulations are based on optical conditions reconstructed from $PM_{2.5}$ and PM_{10} data collected every third day under the IMPROVE program.

Estimation of Emission Factors: AP-42

Air quality impacts for various air pollutants are determined by the use of air dispersion models using specific source emission rates. For natural gas compressors, the emissions of nitrogen oxides are determined by the assumed permitted emission rate allowed by the state. For fugitive dust impacts, emission rates are obtained from EPA's AP–42 document that is titled "Compilation of Air Pollutant Emission Factors." An AP–42 emission factor is a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant. Emission factors may be appropriate to use in a number of situations such as making source-specific emission estimates for areawide inventories. These inventories have many purposes including ambient dispersion modeling and analysis, control strategy development, and in screening sources for compliance investigations. In most cases, these factors are simply averages of all available data of acceptable quality, and are generally assumed to be representative of long-term averages for all sources in a specific category.

Modeling Assumptions

When reviewing the predicted near- and far-field air quality impacts, it is important to understand that assumptions were made regarding development, emissions, meteorology, atmospheric transport and chemistry, and atmospheric deposition. For example, there is uncertainty regarding ultimate development (i.e., number of wells, equipment to be used, specific locations of wells, etc.).

The following assumptions were used in the analysis:

- Total predicted short-term air pollutant impact concentrations were assumed to be the sum of the assumed background concentration, plus the predicted maximum cumulative modeled concentrations, which may occur under different meteorological conditions.
- Assumed background air pollution concentrations were assumed to occur throughout the 20-year LOP at all locations in the region, even though monitoring is primarily conducted in urban or industrial areas, rather than rural areas. The uniform background PM_{10} levels for each state are assumed to be representative of the background conditions for the entire modeled area of the PRB, based on monitoring data gathered throughout northeastern Wyoming and southeastern Montana.
- The maximum predicted air quality impacts occur only in the vicinity of the anticipated emission sources. Actual impacts would likely be less at distances beyond the predicted points of maximum impact.
- All emission sources were assumed to operate at their reasonably foreseeable maximum emission rates simultaneously throughout the LOP. Given the number of sources included in this analysis, the co-probability of such a scenario actually occurring over an entire year (or even 24-hours) is small.
- In developing the emissions inventory and model, there is uncertainty regarding ultimate development (i.e., number of wells, equipment to be used, specific locations, etc.) Most (90 percent) proposed CBM wells and 30 percent of conventional wells were assumed to be fully operational and remain operating (no shut ins) throughout the LOP.
- The total proposed booster (field) and pipeline (sales) compression engines were assumed to operate at their rated capacities continuously throughout the LOP (no phased increases or reductions). In reality, compression equipment would be added or removed incrementally as required by the well field operation, compressor engines would operate be-

low full horsepower ratings, and it is unlikely all compressor stations would operate at maximum levels simultaneously.

- The HAP analyses assumed a 9,900 horsepower, six-unit, reciprocating compressor engine station would operate at full load and at maximum emission levels continuously throughout the LOP.
- The emissions inventory and model use peak years of construction and peak years of operations, which would not occur throughout the entire development region at the same time. However, it is possible that conditions close to this could occur in some isolated areas.
- The emissions inventory and model assumed a NO_x emission rate for compressor engines of 1.5 g/hp-hr in Montana and 1.0 g/hp-hr in Wyoming. Since BACT is decided on a case-by-case basis, actual emission rates could be decided to be less or more than this level by the Departments of Environmental Quality in Wyoming or Montana, and on Indian lands by EPA, for field and sales compressor engines. Actual NO_x emission rates may range from 0.7 to 2 g/hp-hr.
- There are no applicable local, state, tribal or federal acid deposition standards. In the absence of applicable standards, the acid deposition analysis assumed that a "limit of acceptable change" is: a 10 percent change in acid neutralizing capacity (ANC) for lakes with a background ANC greater than 25 µeq/l; or a 1 µeq/l change in ANC for lakes with a background ANC less than 25 µeq/l, and would be a reasonably foreseeable significant adverse impact. Further, the atmospheric deposition impact analysis assumed no other ecosystem components would affect lake chemistry for a full year (assuming no chemical buffering due to interaction with vegetation or soil materials).
- The visibility impact analysis assumed that a 1.0 dv "just noticeable change" would be a reasonably foreseeable significant adverse impact, although there are no applicable local, state, tribal or federal regulatory visibility standards. However, some FLMs are using 0.5 dv as a screening threshold for significance.
- Mitigation measures are included in the emissions inventory and model that may not be achievable in all circumstances. However, actual mitigation decided by the developers and local and state authorities may be greater or less than those assumed in the analysis. For example, maintaining a construction road speed limit of 15 mph may be reasonable in a construction zone but difficult to enforce elsewhere. Full (100%) mitigation of fugitive dust from disturbed lands may not be achievable. Further, 50% reduction in fugitive emissions is assumed based on construction road wetting on the unimproved access road to the pad and at the pad, but this level of effectiveness is characterized as the maximum possible. Wetting was assumed for maintenance traffic, which is not likely to occur, but this is considered to be a small effect because of limited traffic.
- Induced or secondary growth related to increases in vehicle miles traveled (VMT) (believed to be on the order of 10 percent overall) is not included in the emissions inventory and model. Not all fugitive dust emissions (including county and other collector roads) have been included in the emissions inventory and model.

- Fugitive dust emissions from roads are treated as area sources rather than line sources in the model, which may thereby reduce or increase the predicted ambient concentrations at maximum concentration receptor points near the source, depending on the inputs to the model (meteorology, terrain, etc.) By not placing modeled receptors close to emission sources (e.g. wells and roads), the model may not capture higher ambient concentrations near these sources. A more refined, regulatory model may yield higher concentrations at locations near fugitive dust sources.
- For comparisons to the PSD Class I and II increments, the emissions inventory and model included only CBM and RFFD sources. Other existing increment consuming sources such as Campbell County coal mines were not included in this comparison, as the air quality analysis does not represent a regulatory PSD increment consumption analysis. A regulatory PSD increment consumption analysis needs to identify and consider all PSD increment consuming sources to determine the level of PSD Class II increment consumption. Monitoring data in Wyoming has indicated an upward trend in PM concentrations in Campbell County since 1999, which coincides with CBM development but is also exacerbated by prolonged drought in the region.

It is important to note that before actual development could occur, the applicable air quality regulatory agencies (including the state, tribe or EPA) would review specific air pollutant emissions preconstruction permit applications that examine potential project-specific air quality impacts. As part of these permit reviews (depending on source size), the air quality regulatory agencies could require additional air quality impact analyses or mitigation measures. Thus, before development occurs, additional site-specific air quality analyses would be performed to ensure protection of air quality.

Modeling Results

The following Tables present the detailed atmospheric dispersion modeling results which are summarized in **Chapter 4 — Environmental Consequences (Air Quality)**.

Table AQ-4 Predicted Hazardous Air Pollutant Impacts and Significance Thresholds (in $\mu g/m^3$)

Pollutant	Averaging Time	Direct Modeled Impact	Range of State Acceptable Ambient Concentration Levels
formaldehyde	8-hours	**11.9**	**4.5** (FL07) - 71 (NV01)
n-hexane	8-hours	0.6	1,800 (FL07) - 36,000 (CT01)
benzene	8-hours	0.7	30 (FL04) - 714 (NV01)
toluene	8-hours	4.6	1,870 (IN03) - 8,930 (NV01)
ethyl benzene	8-hours	< 0.1	4,340 (ND01) - 43,500 (VT01)
xylene	8-hours	0.2	2,170 (IN01) - 10,400 (NV01)

Source: Argonne (2002)

Agencies:

CT01 - Connecticut Department of Environmental Protection; Air Compliance Unit
FL04 - Broward County Department of Natural Resource Protection (Florida)
FL07 - Pinellas County Air Pollution Control Board (Florida)
IN01 - Indiana Department of Environmental Management
IN03 - Indianapolis Air Pollution Control Division (Indiana)
ND01 - North Dakota Dept. of Health; Division of Environmental Engineering
NV01 - Nevada Division of Environmental Protection; Air Quality Control
VT01 - Vermont Dept of Environmental Conservation; Air Pollution Control Division

Table AQ-5 Alternative 1 - Predicted Criteria Pollutant Impacts and Applicable Significance Thresholds (in $\mu g/m^3$)

Pollutant	Avg Time [a]	Location	Increment	Alt 1	Other	Cum	Background	Total	National	Wyoming
carbon monoxide	1-hour	near-field	- - -	223	142	224	3,500	3,724	40,000	40,000
		far-field [1]	- - -	5	100	100	3,500	3,600	40,000	40,000
	8-hours	near-field	- - -	156	124	156	1,500	1,656	10,000	10,000
		far-field [2]	- - -	19	70	78	1,500	1,578	10,000	10,000
nitrogen dioxide	Annual	near-field	25	8.0	3.3	10.5	17	27	100	100
		far-field [3]	25	0.4	5.1	5.4	17	22	100	100
		far-field [2]	**2.5**	0.3	**3.9** [b]	**4.2** [b]	17	21	100	100
$PM_{2.5}$	24-hours	near-field	- - -	16.0	8.6	24.4	19	43	65	65
		far-field [3]	- - -	5.1	9.7	14.7	19	34	65	65
	Annual	near-field	- - -	1.7	0.7	2.3	8	10	15	15
		far-field [3]	- - -	0.2	1.1	1.2	8	9	15	15
PM_{10}	24-hours	near-field	**30**	20.2	9.3	**30.8** [b]	42	73	150	150
		far-field [4]	30	0.5	29.7	29.7	42	72	150	150
		far-field [2]	**8**	3.9	**9.4** [b]	**12.8** [b]	42	55	150	150
		far-field [5]	**8**	2.2	7.0	**9.2** [b]	42	51	150	150
	Annual	near-field	17	3.3	0.9	4.1	17	21	50	50
		far-field [4]	17	<0.1	2.7	2.7	17	20	50	50
sulfur dioxide	3-hours	near-field	512	3.3	4.5	4.6	8	13	1,300	1,300
		far-field [3]	512	0.7	17.1	17.1	8	25	1,300	1,300
	24-hours	near-field	91	1.7	1.8	3.2	8	11	365	260
		far-field [3]	91	0.3	5.3	5.3	8	13	365	260
	Annual	near-field	20	0.5	0.2	0.6	3	4	80	60
		far-field [3]	20	<0.1	0.4	0.4	3	3	80	60

Table AQ-5 Alternative 1 - Predicted Criteria Pollutant Impacts and Applicable Significance Thresholds (in $\mu g/m^3$) - Footnotes

Source: Argonne (2002)

Notes:

[a] Annual impacts are the first maximum value; short-term impacts are the second maximum value.

[b] It is possible that **Other** and **Cum** emission sources could exceed the PSD Class I increment on the Northern Cheyenne Indian Reservation, and that **Cum** emission sources could exceed the PSD Class I increment in the Washakie Wilderness Area, and the PSD Class II increment near the maximum potential development; a regulatory "PSD Increment Consumption Analysis" should be conducted during permitting by the appropriate Air Quality Regulatory Agency.

Alt 1 - Direct modeled Alternative 1 impacts.

Other - Direct modeled "Non-project" impacts. The impact from all air pollutant emission sources not included in **Alt 1**, including the Montana Final Statewide Oil and Gas EIS and Proposed Amendment of the Powder River and Billings Resource Management PlansDEIS Alternative B/C/E sources. Potential impacts from Montana Alternatives A and D would be less.

Cum - Cumulative modeled impacts. Since these values represent the maximum cumulative impact location, they may not be a simple sum of the maximum direct **Alt 1** and **Other** impacts, which can occur a different locations.

Total - The sum of the cumulative modeled impact and the assumed background concentration.

National - Applicable National Ambient Air Quality Standard.

Wyoming - Applicable Wyoming Ambient Air Quality Standard.

Locations:

[1] Absaroka-Beartooth Wilderness Area

[2] Northern Cheyenne Indian Reservation

[3] Crow Indian Reservation

[4] Fort Belknap Indian Reservation

[5] Washakie Wilderness Area

Table AQ-6 Alternative 1 - Predicted Atmospheric Deposition Impacts and Applicable Significance Thresholds

			Total Sulfur Deposition (kg/ha-yr)				Total Nitrogen Deposition (kg/ha-yr)				Acid Neutralizing Capacity (percent)				
Location	**PSD Class**	**Lake**	**Alt 1**	**Other**	**Cum**	**Thld**	**Alt 1**	**Other**	**Cum**	**Thld**	**Bkgd (µeq/l)**	**Alt 1**	**Other**	**Cum**	**Thld**
Bridger WA	I	Black Joe	<0.01	0.01	0.01	5	0.01	0.02	0.03	3	69.0	0.7	1.9	2.6	10
		Deep	<0.01	0.01	0.01	5	0.01	0.02	0.03	3	61.0	0.8	2.1	2.9	10
		Hobbs	<0.01	0.01	0.01	5	0.01	0.01	0.02	3	68.0	0.4	1.1	1.5	10
		Upper Frozen	<0.01	0.01	0.01	5	0.01	0.02	0.03	3	5.8[a]	0.5 [a]	**1.3** [a]	**1.8** [a]	**1** [a]
Fitzpatrick WA	I	Ross	<0.01	0.01	0.01	5	0.01	0.02	0.02	3	61.4	0.5	1.6	2.1	10
Absaroka-Beartooth WA	II	Stepping Stone	<0.01	0.02	0.02	5	0.01	0.03	0.03	3	27.0	0.3	2.2	2.5	10
		Twin Island	<0.01	0.02	0.02	5	0.01	0.03	0.03	3	36.0	0.2	1.6	1.8	10
Cloud Peak WA	II	Emerald	<0.01	0.03	0.03	5	0.04	0.07	0.10	3	53.3	1.7	4.2	5.9	10
		Florence	<0.01	0.03	0.03	5	0.04	0.07	0.11	3	32.7	3.1	7.2	**10.4** [b]	**10** [b]
Popo Agie WA	II	Lower Saddle-bag	<0.01	0.01	0.01	5	0.01	0.02	0.04	3	55.5	1.0	2.6	3.6	10

Source: Argonne (2002)

Notes: **Alt 1** - Direct modeled Alternative 1 impacts.

Other - Direct modeled "Non-project" impacts. The impact from all air pollutant emission sources not included in **Alt 1**, including the Final Statewide Oil and Gas EIS and Proposed Amendment of the Powder River and Billings Resource Management Plans "Powder River Basin Oil and Gas Project" DEIS Alternative B/C/E sources. Potential impacts from Montana Alternatives A and D would be less.

Cum - Cumulative modeled impacts. Since these values represent the maximum cumulative impact at a specific location, they are the sum of the maximum direct **Alt 1** and **Other** impacts.

Thld - Impact threshold. Total sulfur and nitrogen thresholds from Fox, et al. (1989); acid neutralizing capaeity thresholds from FS (2000).

WA - Wilderness Area.

[a] Since the background acid neutralizing capacity at Upper Frozen Lake is less than 25 µeq/l, the applicable significance threshold is less than a 1 µeq/l change. This threshold is exceeded by **Other** and **Cum** emission sources. However, the background concentration is based on only six samples taken on four days between 1997 and 2001.

[b] Potential changes in acid neutralizing capacity is predicted to exceed the applicable significance level by less than one percent due to **Cum** emission sources.

Table AQ-7 Alternative 1 - Daily FLAG Refined Method - Visibility Impact Analysis (number of days >1.0 dv per year)

Sensitive Location	PSD Classification	Alt 1	Other	Cum
Badlands WA	mandatory federal Class I	3	13 to 17	24 to 28
Bridger WA	mandatory federal Class I	4	7 to 9	10 to 12
Fitzpatrick WA	mandatory federal Class I	4	6 to 9	10 to 12
Gates of the Mountains WA	mandatory federal Class I	0	3 to 4	4 to 4
Grand Teton NP	mandatory federal Class I	1	3 to 5	6 to 8
North Absaroka WA	mandatory federal Class I	4	9 to 13	12 to 15
Red Rock Lakes WA	mandatory federal Class I	0	0 to 1	1 to 3
Seapegoat WA	mandatory federal Class I	0	2 to 2	3 to 3
Teton WA	mandatory federal Class I	3	6 to 9	10 to 11
Theodore Roosevelt NMP (North)	mandatory federal Class I	0	0 to 1	2 to 3
Theodore Roosevelt NMP (South)	mandatory federal Class I	1	1 to 3	4 to 7
U.L. Bend WA	mandatory federal Class I	1	4 to 5	6 to 8
Washakie WA	mandatory federal Class I	5	10 to 14	15 to 18
Wind Cave NP	mandatory federal Class I	4	17 to 21	28 to 32
Yellowstone NP	mandatory federal Class I	3	8 to 11	11 to 13
Fort Peek IR	Tribal designated Class I	0	1 to 3	2 to 5
Northern Cheyenne IR	Tribal designated Class I	17	27 to 82	42 to 92
Absaroka-Beartooth WA	federal Class II	4	28 to 32	30 to 33
Agate Fossil Beds NM	federal Class II	2	8 to 11	15 to 19
Bighorn Canyon NRA	federal Class II	9	17 to 30	23 to 34
Black Elk WA	federal Class II	4	17 to 20	26 to 31
Cloud Peak WA	federal Class II	13	17 to 30	30 to 39
Crow IR	federal Class II	20	59 to 108	69 to 116
Devils Tower NM	federal Class II	9	17 to 25	39 to 47
Fort Belknap IR	federal Class II	1	60 to 61	61 to 62
Fort Laramie NHS	federal Class II	2	10 to 14	17 to 20
Jewel Cave NM	federal Class II	4	19 to 23	32 to 36
Mount Rushmore NMem	federal Class II	3	13 to 17	22 to 26
Popo Agie WA	federal Class II	4	7 to 9	10 to 13
Soldier Creek WA	federal Class II	2	10 to 13	18 to 21

Source: Argonne (2002)

Notes: **Alt 1** - Direct modeled Alternative 1 impacts.

Other- Direct modeled "Non-project" impacts. The impact from all air pollutant emission sources not included in **Alt 1**, including the Final Statewide Oil and Gas EIS and Proposed Amendment of the Powder River and Billings Resource Management Plans "Powder River Basin Oil and Gas Project" DEIS sources. The range of values corresponds to including Montana Alternative A (low) to Montana Alternative B/C/E (high).

Cum - Cumulative modeled impacts. Since these values represent the maximum visibility impact anywhere within the sensitive location, they may not be a simple sum of the maximum direct **Alt 1** and **non-project** impacts, which can occur at different locations.

Locations: **IR** - Indian Reservation. **NHS** - National Historic Site. **NM** - National Monument **NMP** - National Memorial Park **NMem** - National Memorial. **NP** - National Park. **NRA** - National Recreation Area **WA** - Wilderness Area.

Table AQ-8 Alternative 2A - Predicted Criteria Pollutant Impacts and Applicable Significance Thresholds (in μg/m^3)

Pollutant	Avg Time [a]	Location	Increment	Alt 2A	Other	Cum	Background	Total	National	Wyoming
carbon monoxide	1-hour	near-field	- - -	158	142	197	3,500	3,697	40,000	40,000
		far-field [1]	- - -	4	100	100	3,500	3,600	40,000	40,000
	8-hours	near-field	- - -	93	124	132	1,500	1,632	10,000	10,000
		far-field [2]	- - -	14	70	76	1,500	1,576	10,000	10,000
nitrogen dioxide	Annual	near-field	25	7.2	3.3	9.6	17	27	100	100
		far-field [3]	25	0.4	5.1	5.4	17	22	100	100
		far-field [2]	**2.5**	0.2	**3.9** [b]	**4.1** [b]	17	21	100	100
PM$_{2.5}$	24-hours	near-field	- - -	13.0	8.6	21.3	19	40	65	65
		far-field [3]	- - -	4.5	9.7	14.0	19	33	65	65
	Annual	near-field	- - -	1.5	0.7	2.1	8	10	15	15
		far-field [3]	- - -	0.2	1.1	1.2	8	9	15	15
PM$_{10}$	24-hours	near-field	30	17.5	9.3	27.7	42	70	150	150
		far-field [4]	30	0.4	29.7	29.7	42	72	150	150
		far-field [2]	**8**	3.4	**9.4** [b]	**12.4** [b]	42	54	150	150
		far-field [5]	**8**	1.8	7.0	**8.8** [b]	42	51	150	150
	Annual	near-field	17	3.1	0.9	3.9	17	21	50	50
		far-field [4]	17	<0.1	2.7	2.7	17	20	50	50
sulfur dioxide	3-hours	near-field	512	3.3	4.5	4.6	8	13	1,300	1,300
		far-field [3]	512	0.7	17.1	17.1	8	25	1,300	1,300
	24-hours	near-field	91	1.7	1.8	3.2	8	11	365	260
		far-field [3]	91	0.3	5.3	5.3	8	13	365	260
	Annual	near-field	20	0.5	0.2	0.6	3	4	80	60
		far-field [3]	20	<0.1	0.4	0.4	3	3	80	60

Table AQ-8 Alternative 2A - Predicted Criteria Pollutant Impacts and Applicable Significance Thresholds (in $\mu g/m^3$) - Footnotes

Source: Argonne (2002)

Notes: [a] Annual impacts are the first maximum value; short-term impacts are the second maximum value.

[b] It is possible that **Other** and **Cum** emission sources could exceed the PSD Class I increment on the Northern Cheyenne Indian Reservation, and that **Cum** emission sources could exceed the PSD Class I increment in the Washakie Wilderness Area; a regulatory “PSD Increment Consumption Analysis” should be conducted during permitting by the appropriate Air Quality Regulatory Agency.

Alt 2A - Direct modeled Alternative 2A impacts.

Other - Direct modeled “Non-project” impacts. The impact from all air pollutant emission sources not included in **Alt 2A**, including the Final Statewide Oil and Gas EIS and Proposed Amendment of the Powder River and Billings Resource Management Plans “Powder River Basin Oil and Gas Project” DEIS Alternative B/C/E sources. Potential impacts from Montana Alternatives A and D would be less.

Cum - Cumulative modeled impacts. Since these values represent the maximum cumulative impact location, they may not be a simple sum of the maximum direct **Alt 2A** and **Other** impacts, which can occur at different locations.

Total - The sum of the cumulative modeled impact and the assumed background concentration.

National - Applicable National Ambient Air Quality Standard.

Wyoming - Applicable Wyoming Ambient Air Quality Standard.

Locations:

[1] Absaroka-Beartooth Wilderness Area

[2] Northern Cheyenne Indian Reservation

[3] Crow Indian Reservation

[4] Fort Belknap Indian Reservation

[5] Washakie Wilderness Area

Table AQ-9 Alternative 2A - Predicted Atmospheric Deposition Impacts and Applicable Significance Thresholds

			Total Sulfur Deposition (kg/ha-yr)				Total Nitrogen Deposition (kg/ha-yr)				Acid Neutralizing Capacity (percent)				
Location	**PSD Class**	**Lake**	**Alt 2A**	**Other**	**Cum**	**Thld**	**Alt 2A**	**Other**	**Cum**	**Thld**	**Bkgd (µeq/l)**	**Alt 2A**	**Other**	**Cum**	**Thld**
Bridger WA	I	Black Joe	<0.01	0.01	0.01	5	0.01	0.02	0.03	3	69.0	0.6	1.9	2.5	10
		Deep	<0.01	0.01	0.01	5	0.01	0.02	0.03	3	61.0	0.7	2.1	2.8	10
		Hobbs	<0.01	0.01	0.01	5	0.01	0.01	0.02	3	68.0	0.3	1.1	1.5	10
		Upper Frozen	<0.01	0.01	0.01	5	0.01	0.02	0.03	3	5.8[a]	0.5 [a]	**1.3 [a]**	**1.8 [a]**	**1 [a]**
Fitzpatrick WA	I	Ross	<0.01	0.01	0.01	5	0.01	0.02	0.02	3	61.4	0.5	1.6	2.0	10
Absaroka-Beartooth WA	II	Stepping Stone	<0.01	0.02	0.02	5	<0.01	0.03	0.03	3	27.0	0.3	2.2	2.5	10
		Twin Island	<0.01	0.02	0.02	5	<0.01	0.03	0.03	3	36.0	0.2	1.6	1.8	10
Cloud Peak WA	II	Emerald	<0.01	0.03	0.03	5	0.03	0.07	0.10	3	53.3	1.5	4.2	5.7	10
		Florence	<0.01	0.03	0.03	5	0.03	0.07	0.10	3	32.7	2.8	7.2	10.0	10
Popo Agie WA	II	Lower Saddlebag	<0.01	0.01	0.01	5	0.01	0.02	0.03	3	55.5	0.9	2.6	3.5	10

Source: Argonne (2002)

Notes: **Alt 2A** - Direct modeled Alternative 2A impacts.

Other - Direct modeled "Non-project" impacts. The impact from all air pollutant emission sources not included in **Alt 2A**, including the Final Statewide Oil and Gas EIS and Proposed Amendment of the Powder River and Billings Resource Management Plans "Powder River Basin Oil and Gas Project" DEIS Alternative B/C/E sources. Potential impacts from Montana Alternatives A and D would be less.

Cum - Cumulative modeled impacts. Since these values represent the maximum cumulative impact at a specific location, they are the sum of the maximum direct **Alt 2A** and **Other** impacts.

Thld - Impact threshold. Total sulfur and nitrogen thresholds from Fox, et al. (1989); acid neutralizing capacity thresholds from FS (2000).

WA - Wilderness Area.

[a] Since the background acid neutralizing capacity at Upper Frozen Lake is less than 25 µeq/l, the applicable significance threshold is less than a 1 µeq/l change. This threshold is exceeded by **Other** and **Cum** emission sources. However, the background concentration is based on only six samples taken on four days between 1997 and 2001.

Table AQ-10 Alternative 2A - Daily FLAG Refined Method - Visibility Impact Analysis (number of days >1.0 dv per year)

Sensitive Location	PSD Classification	Alt 2A	Other	Cum
Badlands WA	mandatory federal Class I	3	13 to 17	24 to 27
Bridger WA	mandatory federal Class I	4	7 to 9	10 to 12
Fitzpatrick WA	mandatory federal Class I	3	6 to 9	9 to 12
Gates of the Mountains WA	mandatory federal Class I	0	3 to 4	4 to 4
Grand Teton NP	mandatory federal Class I	1	3 to 5	6 to 7
North Absaroka WA	mandatory federal Class I	3	9 to 13	12 to 14
Red Rock Lakes WA	mandatory federal Class I	0	0 to 1	1 to 3
Scapegoat WA	mandatory federal Class I	0	2 to 2	2 to 3
Teton WA	mandatory federal Class I	3	6 to 9	9 to 11
Theodore Roosevelt NMP (North)	mandatory federal Class I	0	0 to 1	2 to 3
Theodore Roosevelt NMP (South)	mandatory federal Class I	0	1 to 3	4 to 6
U.L. Bend WA	mandatory federal Class I	1	4 to 5	5 to 8
Washakie WA	mandatory federal Class I	4	10 to 14	14 to 18
Wind Cave NP	mandatory federal Class I	3	17 to 21	27 to 30
Yellowstone NP	mandatory federal Class I	2	8 to 11	11 to 13
Fort Peck IR	Tribal designated Class I	0	1 to 3	2 to 5
Northern Cheyenne IR	Tribal designated Class I	16	27 to 82	39 to 91
Absaroka-Beartooth WA	federal Class II	3	28 to 32	29 to 33
Agate Fossil Beds NM	federal Class II	1	8 to 11	14 to 17
Bighorn Canyon NRA	federal Class II	8	17 to 30	22 to 34
Black Elk WA	federal Class II	3	17 to 20	25 to 29
Cloud Peak WA	federal Class II	12	17 to 30	28 to 38
Crow IR	federal Class II	16	59 to 108	69 to 115
Devils Tower NM	federal Class II	6	17 to 25	36 to 44
.Fort Belknap IR	federal Class II	1	60 to 61	61 to 61
Fort Laramie NHS	federal Class II	2	10 to 14	17 to 19
Jewel Cave NM	federal Class II	3	19 to 23	30 to 35
Mount Rushmore NMem	federal Class II	2	13 to 17	21 to 25
Popo Agie WA	federal Class II	3	7 to 9	10 to 12
Soldier Creek WA	federal Class II	1	10 to 13	17 to 21

Source: Argonne (2002)

Notes: **Alt 2A** - Direct modeled Alternative 2A impacts.

Other - Direct modeled "Non-project" impacts. The impact from all air pollutant emission sources not included in **Alt 2A**, including the Montana "Powder River Basin Oil and Gas Project" DEIS sources. The range of values corresponds to including Montana Alternative A (low) to Montana Alternative B/C/E (high).

Cum - Cumulative modeled impacts. Since these values represent the maximum visibility impact anywhere within the sensitive location, they may not be a simple sum of the maximum direct **Alt 2A** and **Other** impacts, which can occur at different locations.

Locations: **IR** - Indian Reservation. **NHS** - National Historic Site. **NM** - National Monument **NMP** - National Memorial Park **NMem** - National Memorial. **NP** - National Park. **NRA** - National Recreation Area **WA** - Wilderness Area.

Table AQ-11 Alternative 2B - Predicted Criteria Pollutant Impacts and Applicable Significance Thresholds (in µg/m^3)

Pollutant	Avg Time [a]	Location	Increment	Alt 2B	Other	Cum	Background	Total	National	Wyoming
carbon monoxide	1-hour	near-field	- - -	157	142	170	3,500	3,670	40,000	40,000
		far-field [1]	- - -	3	100	100	3,500	3,600	40,000	40,000
	8-hours	near-field	- - -	77	124	124	1,500	1,624	10,000	10,000
		far-field [2]	- - -	9	70	74	1,500	1,574	10,000	10,000
nitrogen dioxide	Annual	near-field	25	6.3	3.3	8.8	17	26	100	100
		far-field [3]	25	0.3	5.1	5.3	17	22	100	100
		far-field [2]	**2.5**	0.2	**3.9 [b]**	**4.1 [b]**	17	21	100	100
PM$_{2.5}$	24-hours	near-field	- - -	10.7	8.6	19.0	19	38	65	65
		far-field [3]	- - -	3.8	9.7	13.4	19	32	65	65
	Annual	near-field	- - -	1.3	0.7	2.0	8	10	15	15
		far-field [3]	- - -	0.1	1.1	1.2	8	9	15	15
PM$_{10}$	24-hours	near-field	30	15.2	9.3	25.5	42	67	150	150
		far-field [4]	30	0.4	29.7	29.7	42	72	150	150
		far-field [2]	**8 [b]**	3.0	**9.4 [b]**	**12.1 [b]**	42	54	150	150
		far-field [5]	**8**	1.5	7.0	**8.5 [b]**	42	50	150	150
	Annual	near-field	17	2.9	0.9	3.7	17	21	50	50
		far-field [4]	17	<0.1	2.7	2.7	17	20	50	50
sulfur dioxide	3-hours	near-field	512	3.3	4.5	4.6	8	13	1,300	1,300
		far-field [3]	512	0.7	17.1	17.1	8	25	1,300	1,300
	24-hours	near-field	91	1.7	1.8	3.2	8	11	365	260
		far-field [3]	91	0.3	5.3	5.3	8	13	365	260
	Annual	near-field	20	0.5	0.2	0.6	3	4	80	60
		far-field [3]	20	<0.1	0.4	0.4	3	3	80	60

Table AQ-11 Alternative 2B - Predicted Criteria Pollutant Impacts and Applicable Significance Thresholds (in µg/m^3) – Footnotes

Source: Argonne (2002)

Notes: [a] Annual impacts are the first maximum value; short-term impacts are the second maximum value.

[b] It is possible that **Other** and **Cum** emission sources could exceed the PSD Class I increment on the Northern Cheyenne Indian Reservation, and that **Cum** emission sources could exceed the PSD Class I increment in the Washakie Wilderness Area; a regulatory “PSD Increment Consumption Analysis” should be conducted during permitting by the appropriate Air Quality Regulatory Agency.

Alt 2B - Direct modeled Alternative 2B impacts.

Other - Direct modeled “Non-project” impacts. The impact from all air pollutant emission sources not included in **Alt 2B**, including the Final Statewide Oil and Gas EIS and Proposed Amendment of the Powder River and Billings Resource Management Plans “Powder River Basin Oil and Gas Project” DEIS Alternative B/C/E sources. Potential impacts from Montana Alternatives A and D would be less.

Cum - Cumulative modeled impacts. Since these values represent the maximum cumulative impact location, they may not be a simple sum of the maximum direct **Alt 2B** and **Other** impacts, which can occur a different locations.

Total - The sum of the cumulative modeled impact and the assumed background concentration.

National - Applicable National Ambient Air Quality Standard.

Wyoming - Applicable Wyoming Ambient Air Quality Standard.

Locations:

[1] Absaroka-Beartooth Wilderness Area

[2] Northern Cheyenne Indian Reservation

[3] Crow Indian Reservation

[4] Fort Belknap Indian Reservation

[5] Washakie Wilderness Area

Table AQ-12 Alternative 2B - Predicted Atmospheric Deposition Impacts and Applicable Significance Thresholds

			Total Sulfur Deposition (kg/ha-yr)				Total Nitrogen Deposition (kg/ha-yr)				Acid Neutralizing Capacity (percent)				
Location	**PSD Class**	**Lake**	**Alt 2B**	**Other**	**Cum**	**Thld**	**Alt 2B**	**Other**	**Cum**	**Thld**	**Bkgd (µeq/l)**	**Alt 2B**	**Other**	**Cum**	**Thld**
Bridger WA	I	Black Joe	<0.01	0.01	0.01	5	0.01	0.02	0.03	3	69.0	0.6	1.9	2.4	10
		Deep	<0.01	0.01	0.01	5	0.01	0.02	0.03	3	61.0	0.6	2.1	2.7	10
		Hobbs	<0.01	0.01	0.01	5	<0.01	0.01	0.02	3	68.0	0.3	1.1	1.4	10
		Upper Frozen	<0.01	0.01	0.01	5	0.01	0.02	0.03	3	5.8[a]	0.4 [a]	**1.3** [a]	**1.7** [a]	**1** [a]
Fitzpatrick WA	I	Ross	<0.01	0.01	0.01	5	0.01	0.02	0.02	3	61.4	0.4	1.6	2.0	10
Absaroka-Beartooth WA	II	Stepping Stone	<0.01	0.02	0.02	5	<0.01	0.03	0.03	3	27.0	0.2	2.2	2.5	10
		Twin Island	<0.01	0.02	0.02	5	<0.01	0.03	0.03	3	36.0	0.2	1.6	1.8	10
Cloud Peak WA	II	Emerald	<0.01	0.03	0.03	5	0.03	0.07	0.10	3	53.3	1.3	4.2	5.5	10
		Florence	<0.01	0.03	0.03	5	0.03	0.07	0.10	3	32.7	2.5	7.2	9.7	10
Popo Agie WA	II	Lower Saddlebag	<0.01	0.01	0.01	5	0.01	0.02	0.03	3	55.5	0.8	2.6	3.4	10

Source: Argonne (2002)

Notes: **Alt 2B** - Direct modeled Alternative 2B impacts.

Other - Direct modeled "Non-project" impacts. The impact from all air pollutant emission sources not included in **Alt 2B**, including the Final Statewide Oil and Gas EIS and Proposed Amendment of the Powder River and Billings Resource Management Plans "Powder River Basin Oil and Gas Project" DEIS Alternative B/C/E sources. Potential impacts from Montana Alternatives A and D would be less.

Cum - Cumulative modeled impacts. Since these values represent the maximum cumulative impact at a specific location, they are the sum of the maximum direct **Alt 2B** and **Other** impacts.

Thld - Impact threshold. Total sulfur and nitrogen thresholds from Fox, et al. (1989); acid neutralizing capacity thresholds from FS (2000).

WA - Wilderness Area.

[a] Since the background acid neutralizing capacity at Upper Frozen Lake is less than 25 µeq/l, the applicable significance threshold is less than a 1 µeq/l change. This threshold is exceeded by **Other** sources alone, as well **Cum** sources. However, the background concentration is based on only six samples taken on four days between 1997 and 2001.

Table AQ-13 Alternative 2B - Daily FLAG Refined Method - Visibility Impact Analysis (number of days >1.0 dv per year)

Sensitive Location	PSD Classification	Alt 2B	Other	Cum
Badlands WA	mandatory federal Class I	1	13 to 17	22 to 26
Bridger WA	mandatory federal Class I	3	7 to 9	9 to 11
Fitzpatrick WA	mandatory federal Class I	3	6 to 9	9 to 11
Gates of the Mountains WA	mandatory federal Class I	0	3 to 4	4 to 4
Grand Teton NP	mandatory federal Class I	0	3 to 5	5 to 7
North Absaroka WA	mandatory federal Class I	2	9 to 13	12 to 14
Red Rock Lakes WA	mandatory federal Class I	0	0 to 1	1 to 2
Scapegoat WA	mandatory federal Class I	0	2 to 2	2 to 3
Teton WA	mandatory federal Class I	2	6 to 9	9 to 11
Theodore Roosevelt NMP (North)	mandatory federal Class I	0	0 to 1	1 to 3
Theodore Roosevelt NMP (South)	mandatory federal Class I	0	1 to 3	3 to 6
U.L. Bend WA	mandatory federal Class I	1	4 to 5	5 to 7
Washakie WA	mandatory federal Class I	4	10 to 14	14 to 17
Wind Cave NP	mandatory federal Class I	2	17 to 21	25 to 28
Yellowstone NP	mandatory federal Class I	1	8 to 11	11 to 13
Fort Peck IR	Tribal designated Class I	0	1 to 3	2 to 4
Northern Cheyenne IR	Tribal designated Class I	14	27 to 82	38 to 90
Absaroka-Beartooth WA	federal Class II	3	28 to 32	29 to 33
Agate Fossil Beds NM	federal Class II	0	8 to 11	13 to 16
Bighorn Canyon NRA	federal Class II	7	17 to 30	21 to 33
Black Elk WA	federal Class II	2	17 to 20	24 to 28
Cloud Peak WA	federal Class II	9	17 to 30	27 to 37
Crow IR	federal Class II	14	59 to 108	68 to 115
Devils Tower NM	federal Class II	5	17 to 25	34 to 42
Fort Belknap IR	federal Class II	1	60 to 61	61 to 61
Fort Laramie NHS	federal Class II	1	10 to 14	16 to 19
Jewel Cave NM	federal Class II	2	19 to 23	29 to 33
Mount Rushmore NMem	federal Class II	1	13 to 17	21 to 24
Popo Agie WA	federal Class II	3	7 to 9	10 to 12
Soldier Creek WA	federal Class II	1	10 to 13	16 to 20

Source: Argonne (2002)

Notes: **Alt 2B** - Direct modeled Alternative 2B impacts.

Other- Direct modeled "Non-project" impacts. The impact from all air pollutant emission sources not included in **Alt 2B**, including the Montana "Powder River Basin Oil and Gas Project" DEIS sources. The range of values corresponds to including Montana Alternative A (low) to Montana Alternative B/C/E (high).

Cum - Cumulative modeled impacts. Since these values represent the maximum visibility impact anywhere within the sensitive location, they may not be a simple sum of the maximum direct **Alt 2B** and **Other** impacts, which can occur at different locations.

Locations: **IR** - Indian Reservation. **NHS** - National Historic Site. **NM** - National Monument **NMP** - National Memorial Park **NMem** - National Memorial. **NP** - National Park. **NRA** - National Recreation Area **WA** - Wilderness Area.

Table AQ-14 Alternative 3 - Predicted Criteria Pollutant Impacts and Applicable Significance Thresholds (in µg/m^3)

Pollutant	Avg Time [a]	Location	Increment	Alt 3	Other	Cum	Background	Total	National	Wyoming
carbon monoxide	1-hour	near-field	- - -	261	142	261	3,500	3,761	40,000	40,000
		far-field [1]	- - -	2	100	100	3,500	3,600	40,000	40,000
	8-hours	near-field	- - -	183	124	183	1,500	1,683	10,000	10,000
		far-field [2]	- - -	8	70	75	1,500	1,575	10,000	10,000
nitrogen dioxide	Annual	near-field	25	3.0	3.3	5.8	17	23	100	100
		far-field [3]	25	0.3	5.1	5.3	17	22	100	100
		far-field [2]	**2.5**	0.1	**3.9** [b]	**4.1** [b]	17	21	100	100
PM$_{2.5}$	24-hours	near-field	- - -	5.7	8.6	13.5	19	32	65	65
		far-field [4]	- - -	0.2	12.7	12.7	19	32	65	65
	Annual	near-field	- - -	0.7	0.7	1.3	8	9	15	15
		far-field [4]	- - -	0.0	1.2	1.2	8	9	15	15
PM$_{10}$	24-hours	near-field	30	7.1	9.3	15.6	42	58	150	150
		far-field [4]	30	0.2	29.7	29.7	42	72	150	150
		far-field [2]	**8**	1.5	**9.4** [b]	**10.7** [b]	42	53	150	150
		far-field [5]	8	0.9	7.0	7.8	42	50	150	150
	Annual	near-field	17	1.2	0.9	1.9	17	19	50	50
		far-field [4]	17	<0.1	2.7	2.7	17	20	50	50
sulfur dioxide	3-hours	near-field	512	1.2	4.5	4.6	8	13	1,300	1,300
		far-field [3]	512	0.3	17.1	17.1	8	25	1,300	1,300
	24-hours	near-field	91	0.6	1.8	2.2	8	10	365	260
		far-field [3]	91	0.1	5.3	5.3	8	13	365	260
	Annual	near-field	20	0.2	0.2	0.3	3	3	80	60
		far-field [3]	20	<0.1	0.4	0.4	3	3	80	60

Table AQ-14 Alternative 3 - Predicted Criteria Pollutant Impacts and Applicable Significance Thresholds (in μg/m^3) – Footnotes

Source: Argonne (2002)

Notes:

[a] Annual impacts are the first maximum value; short-term impacts are the second maximum value.

[b] It is possible that **Other** and **Cum** emission sources could exceed the PSD Class I increment on the Northern Cheyenne Indian Reservation; a regulatory "PSD Increment Consumption Analysis" should be conducted during permitting by the appropriate Air Quality Regulatory Agency.

Alt 3 - Direct modeled Alternative 3 impacts.

Other - Direct modeled "Non-project" impacts. The impact from all air pollutant emission sources not included in **Alt 3**, including the Final Statewide Oil and Gas EIS and Proposed Amendment of the Powder River and Billings Resource Management Plans "Powder River Basin Oil and Gas Project" DEIS Alternative B/C/E sources. Potential impacts from Montana Alternatives A and D would be less.

Cum - Cumulative modeled impacts. Since these values represent the maximum cumulative impact location, they may not be a simple sum of the maximum direct **Alt 3** and **Other** impacts, which can occur a different locations.

Total - The sum of the cumulative modeled impact and the assumed background concentration.

National - Applicable National Ambient Air Quality Standard.

Wyoming - Applicable Wyoming Ambient Air Quality Standard.

Locations:

[1] Absaroka-Beartooth Wilderness Area

[2] Northern Cheyenne Indian Reservation

[3] Crow Indian Reservation

[4] Fort Belknap Indian Reservation

[5] Washakie Wilderness Area

Table AQ-15 Alternative 3 - Predicted Atmospheric Deposition Impacts and Applicable Significance Thresholds

			Total Sulfur Deposition (kg/ha-yr)				Total Nitrogen Deposition (kg/ha-yr)				Acid Neutralizing Capacity (percent)				
Location	**PSD Class**	**Lake**	**Alt 3**	**Other**	**Cum**	**Thld**	**Alt 3**	**Other**	**Cum**	**Thld**	**Bkgd (µeq/l)**	**Alt 3**	**Other**	**Cum**	**Thld**
Bridger WA	I	Black Joe	<0.01	0.01	0.01	5	<0.01	0.02	0.03	3	69.0	0.3	1.9	2.1	10
		Deep	<0.01	0.01	0.01	5	<0.01	0.02	0.02	3	61.0	0.3	2.1	2.4	10
		Hobbs	<0.01	0.01	0.01	5	<0.01	0.01	0.02	3	68.0	0.2	1.1	1.3	10
		Upper Frozen	<0.01	0.01	0.01	5	<0.01	0.02	0.02	3	5.8[a]	0.2 [a]	**1.3** [a]	**1.5** [a]	1 [a]
Fitzpatrick WA	I	Ross	<0.01	0.01	0.01	5	<0.01	0.02	0.02	3	61.4	0.2	1.6	1.7	10
Absaroka-Beartooth WA	II	Stepping Stone	<0.01	0.02	0.02	5	<0.01	0.03	0.03	3	27.0	0.1	2.2	2.4	10
		Twin Island	<0.01	0.02	0.02	5	<0.01	0.03	0.03	3	36.0	0.1	1.6	1.7	10
Cloud Peak WA	II	Emerald	<0.01	0.03	0.03	5	0.01	0.07	0.08	3	53.3	0.7	4.2	4.9	10
		Florence	<0.01	0.03	0.03	5	0.02	0.07	0.08	3	32.7	1.3	7.2	8.5	10
Popo Agie WA	II	Lower Saddlebag	<0.01	0.01	0.01	5	<0.01	0.02	0.03	3	55.5	0.4	2.6	3.0	10

Source: Argonne (2002)

Notes: **Alt 3** - Direct modeled Alternative 3 impacts.

Other - Direct modeled "Non-project" impacts. The impact from all air pollutant emission sources not included in **Alt 3**, including the Final Statewide Oil and Gas EIS and Proposed Amendment of the Powder River and Billings Resource Management Plans "Powder River Basin Oil and Gas Project" DEIS Alternative B/C/E sources. Potential impacts from Montana Alternatives A and D would be less.

Cum - Cumulative modeled impacts. Since these values represent the maximum cumulative impact at a specific location, they are the sum of the maximum direct **Alt 3** and **Other** impacts.

Thld - Impact threshold. Total sulfur and nitrogen thresholds from Fox, et al. (1989); acid neutralizing capacity thresholds from FS (2000).

WA - Wilderness Area.

[a] Since the background acid neutralizing capacity at Upper Frozen Lake is less than 25 µeq/l, the applicable significance threshold is less than a 1 µeq/l change. This threshold is exceeded by **Other** sources alone, as well **Cum** sources. However, the background concentration is based on only six samples taken on four days between 1997 and 2001.

Table AQ-16 Alternative 3 - Daily FLAG Refined Method - Visibility Impact Analysis (number of days >1.0 dv per year)

Sensitive Location	PSD Classification	Alt 3	Other	Cum
Badlands WA	mandatory federal Class I	0	13 to 17	18 to 21
Bridger WA	mandatory federal Class I	1	7 to 9	8 to 10
Fitzpatrick WA	mandatory federal Class I	1	6 to 9	8 to 10
Gates of the Mountains WA	mandatory federal Class I	0	3 to 4	3 to 4
Grand Teton NP	mandatory federal Class I	0	3 to 5	4 to 6
North Absaroka WA	mandatory federal Class I	0	9 to 13	11 to 13
Red Rock Lakes WA	mandatory federal Class I	0	0 to 1	0 to 2
Scapegoat WA	mandatory federal Class I	0	2 to 2	2 to 3
Teton WA	mandatory federal Class I	0	6 to 9	7 to 10
Theodore Roosevelt NMP (North)	mandatory federal Class I	0	0 to 1	1 to 2
Theodore Roosevelt NMP (South)	mandatory federal Class I	0	1 to 3	2 to 4
U.L. Bend WA	mandatory federal Class I	0	4 to 5	5 to 6
Washakie WA	mandatory federal Class I	1	10 to 14	12 to 16
Wind Cave NP	mandatory federal Class I	0	17 to 21	22 to 25
Yellowstone NP	mandatory federal Class I	0	8 to 11	9 to 12
Fort Peck IR	Tribal designated Class I	0	1 to 3	2 to 4
Northern Cheyenne IR	Tribal designated Class I	7	27 to 82	33 to 87
Absaroka-Beartooth WA	federal Class II	0	28 to 32	28 to 32
Agate Fossil Beds NM	federal Class II	0	8 to 11	10 to 14
Bighorn Canyon NRA	federal Class II	3	17 to 30	19 to 32
Black Elk WA	federal Class II	0	17 to 20	20 to 24
Cloud Peak WA	federal Class II	3	17 to 30	23 to 35
Crow IR	federal Class II	10	59 to 108	65 to 113
Devils Tower NM	federal Class II	1	17 to 25	26 to 34
Fort Belknap IR	federal Class II	0	60 to 61	61 to 61
Fort Laramie NHS	federal Class II	0	10 to 14	13 to 16
Jewel Cave NM	federal Class II	0	19 to 23	24 to 28
Mount Rushmore NMem	federal Class II	0	13 to 17	17 to 20
Popo Agie WA	federal Class II	1	7 to 9	8 to 11
Soldier Creek WA	federal Class II	0	10 to 13	13 to 16

Source: Argonne (2002)

Notes: **Alt 3** - Direct modeled Alternative 3 impacts.

Other - Direct modeled "Non-project" impacts. The impact from all air pollutant emission sources not included in **Alt 3**, including the Final Statewide Oil and Gas EIS and Proposed Amendment of the Powder River and Billings Resource Management Plans "Powder River Basin Oil and Gas Project" DEIS sources. The range of values corresponds to including Montana Alternative A (low) to Montana Alternative B/C/E (high).

Cum - Cumulative modeled impacts. Since these values represent the maximum visibility impact anywhere within the sensitive location, they may not be a simple sum of the maximum direct **Alt 3** and **Other** impacts, which can occur at different locations.

Locations: **IR** - Indian Reservation. **NHS** - National Historic Site. **NM** - National Monument **NMP** - National Memorial Park **NMem** - National Memorial. **NP** - National Park. **NRA** - National Recreation Area **WA** - Wilderness Area.

Mitigation Options

Mitigation may be applied to fugitive dust and nitrogen oxide (NO_x) impacts. Fugitive dust refers to any particulate matter that is not deliberately emitted by a well-defined source. Fugitive dust sources typically include windblown dust from unvegetated lands and unpaved roads. Table AQ–17 shows several fugitive dust mitigation options available.

Table AQ–17: Fugitive Dust Mitigation Measures (PM_{10}), Effectiveness and Cost

	Dust Sources					
	Disturbed Areas	**Unpaved Roads**[1]				
Mitigation Options	Establish plant cover for all disturbed lands by certain time (re-vegetation)	Water roads to attain certain percent moisture[2]	Apply soil stabilizer	Set and enforce speed limit	Gravel roads	Pave road
Effectiveness	Level proportional to percentage of land cover	0 – 50% reduction in uncontrolled dust emissions	33 to 100% control efficiency	80% for 15 mph[3] 65% for 20 mph[3] 25% for 30 mph[3]	30% reduction	90% reduction
Estimated Cost		$4000/mile	$2,000 to $4,000/mile per year	Unknown	$9,000/mile	$11,000 to $60,000/mile

Notes:

1. Improved and County roads
2. Wetting of construction roads during the construction period. Wetting of construction roads not required for once a month maintenance trips to well pads.
3. Reductions assume 40 mile per hour base speed.

Nitrogen oxide emissions are associated with combustion. Table AQ–18 shows several options available to mitigate NOx impacts.

Table AQ–18: Nitrogen Oxides (NO_x) Mitigation Measures Efficiency

	NO_x Emissions Sources			
	Field Compressors	**Sales Compressors**	**Temporary Diesel Generators[1]**	**Heavy Equipment**
Mitigation Options/ Efficiency	Implement Best Available Control Technology Typically results in a NO_x emission rate of about 1 g/bhp-hr	Implement Best Available Control Technology Typically results in a NO_x emission rate of about 1 g/bhp-hr	Register with State; WDEQ regulate as appropriate	Voluntary use of diesel engines

Notes:

1. Wyoming is currently registering these generators to determine if NO_x emissions are significant.
2. BACT could include electric compression.

Appendix G
Water Well Agreement

Appendix G

Water Well Agreement

This agreement is made and entered into this _______day of _______________, _______by and between ____, hereinafter referred to as " Landowner" and ____, with offices at ____, hereinafter referred to as "Producer."

WHEREAS, Landowner(s) have existing water wells within their property boundaries, providing Landowner(s) water for domestic and agricultural/livestock water,

AND WHEREAS, Producer has acquired leases for the development of Coal Bed Methane Gas (CBM) and intends to drill and complete wells for the production of CBM,

AND WHEREAS, the development and production of CBM usually requires the production of water in conjunction with CBM and may require the localized reduction of water levels within certain individual strata of the Fort Union Coals,

AND WHEREAS, Producer has advised Landowner that the production of water in association with gas could adversely affect the productive capacity of Landowner's existing water wells which draw water from the Fort Union aquifer.

NOW THEREFORE, as consideration for the mutual covenants herein, in order to facilitate the multiple usage of the natural resources consistent with sound environmental practices, to mitigate potential adverse effects on the Landowner's water wells, to assure prompt and effective remediation, and to reduce the need for regulatory intervention by State and Federal agencies, the Landowner and Producer agree as follows:

DEFINITIONS:

Fort Union Coals: The Fort Union Coals, as used herein, shall mean those individual coal beds or several coal beds contained within the Tongue River member of the Fort Union Formation, bounded above by the Wasatch Formation of Eocene, and below by the Lebo Shale Member.

Circle of Influence (COI): The area that falls within the circle, the center of which is the location of a producing CBM well, which has a radius of one-half mile (2;640 feet) and contains approximately 502.66 acres.

Impaired Water Well: Any water well properly permitted with the Wyoming State Engineer's Office existing on the Landowner's property within the COI, existing at the time of the CBM development, that experiences a significant reduction of capacity to deliver water in quantity and/or quality sufficient to support the ordinary and customary use of the well.

Strat Test: Any test well that is drilled with the purpose of obtaining geologic information that is not completed for production and is subsequently plugged and abandoned. Strat Tests may produce water and/or gas for a period not to exceed thirty (30) days without creating a COI.

CSM Well: Any well drilled and completed for the production of coal bed methane that withdraws water and/or gas and water from the aquifer for a period exceeding sixty (60) days,

AGREED:

1. Upon establishment of a COI, the Producer, at its sole cost and risk will measure, or cause to be measured, the static water level and productive capacity (the baseline measurement) of properly permitted water wells within the COI and will attempt to determine the depth and configuration of these wells through consultation with the Landowner and from the records of the State Engineer of the State of Wyoming. The Producer shall also test for the presence of methane in the water wells. Tests shall be performed in accordance with test procedures attached hereto.

2. Landowner shall, upon reasonable notice, allow the testing of water wells within the COI, including a static water level test which may require the cessation of withdrawals of water from the well for a period not to exceed twenty four (24) hours.

3. Producer shall establish a continuing water well monitoring program, the intent of which is to enable the Producer to identify changes in the capacity of the Landowner's water wells within the COI. The Landowner shall allow continued periodic testing of the water wells within the COI for this purpose. Producer shall, upon request of the Landowner, provide all test data, both "baseline data" and monitoring data to the Landowner.

4. If a water well within the COI becomes an "Impaired Water Well" as defined herein, Landowner shall first take reasonable steps to verify that the impairment is not due to mechanical, electrical, down hole integrity, or pump problems and, if none of these problems appear to be the cause of the impairment, Landowner shall notify Producer of the impairment. Notice shall be made by phone and by writing, delivered by hand or by registered mail to the Producer at the noted address.

5. Within sixty (60) days of receipt of Notice of Impairment, Producer shall restore the Landowner's access to water of sufficient quantity and quality to offset such impairment by reconfiguring, redrilling the well, the drilling of a new well, or by other means. It is recognized that additional power costs may be associated with any reconfiguration of an impaired water well. The specific site of the well or water access may be changed by mutual agreement of Producer and Landowner.

6. Producer agrees that upon notice of impairment and during the curative period, to provide and make available water for domestic and livestock usage in quantity, quality, and location required for the maintenance of normal and customary domestic, grazing, and livestock operations. Producer shall develop emergency procedures for immediate delivery of water to any such effected Landowner within twenty-four (24) hours of notice. Producer shall notify all Landowners within any COI of the Producer's representative appointed to handle such matters, providing a local contact and a twenty-four (24) hour emergency contact. Landowner shall make a good faith effort to inform Producer by phone, fax, or

other expedient method of communicating of any impending loss or damage to livestock, allowing Producer a reasonable opportunity to mitigate such damage.

7. In the event it is determined that there is an Impaired Water Well, as defined above, in any COI, that COI shall be expanded based on the location of the impaired well or wells. The COI shall be divided into equal quadrants (NE, NW, SW, SE) and based upon which quadrant the impaired water well is located in, that quadrant shall be expanded by the area include within an arc one eighth of a mile wide (660 feet) outside the existing COI. Likewise, should it be determined that there is an impaired water well within the expanded quadrant of the COI, the quadrant shall be again expanded by another 660 feet increment. This expansion approach shall be used to expand any COI in any direction where impairment is determined during the life of the CBM well. Notwithstanding the above, if no water well exist within any COI or quadrant thereof, the arcs and associated quadrants not containing a water well shall be expanded to include the nearest water well.

8. At any time that the Lessee undertakes activities to enhance Landowner's water well capacity or to restore Landowner's impaired water well capacity, and should such activities require permits from regulatory agencies or permissions from third parties for surface-entry, Landowner shall aid and assist Producer in the obtaining of permits and permissions necessary to conduct the operations. All costs of the operations, including fees for obtaining permits and permissions, shall be borne by the Producer.

9. An Arbitration Board shall be formed for the purpose of arbitrating disputes between . Producer and Landowner under this Agreement. The Board shall consist of five (5) members, each member shall be appointed for a two (2)-year term with two (2) members being selected by vote of those Landowners within the various COIs and two (2) members being selected by vote of the Producers that are party of this Agreement and one (1) member being representative of the Wyoming State Engineer's Office.

10. In instances where a water well has become an Impaired Water Well as defined herein, and Landowner and Producer have not been able to agree on the cause of the damage, the Arbitration Board shall determine the cause of the impairment and decide which of the parties shall ultimately be responsible for bearing the cost of remediation. The Arbitration Board shall have the right to apportion and divide the cost among the parties in the event that both mechanical elements, the responsibility of the Landowner, and aquifer drawdown, the responsibility of the Producer, are both factors in causing the water well to become impaired.

11. In the event that the interpretation or enforcement of this Agreement results in legal action, the cost of such action, including reasonable attorney's fees, shall be borne by the individual parties, except in the event that the Landowner is the Prevailing party, in which case the Producer shall bear the costs.

12. The terms and provisions contained herein shall run with the land and shall be binding on the heirs, successors, and assigns of Landowner and Producer. This agreement shall terminate upon the expiration of the last Oil and Gas Lease or the plugging and

abandonment of the last CBM well to which this Agreement applies, whichever is the later date.

This Agreement may be executed in any number of counterparts, each of which shall be considered an original.

AGREED AND ACCEPTED THIS	**AGREED AND ACCEPTED THIS**
______ Day of _________, ____________	______ Day of _________, ____________
PRODUCER:	**LANDOWNER:**
BY: ____________________	**BY:** ____________________
____________________	**BY:** ____________________
(Name)	(Name)
____________________	____________________
(Title, if applicable)	(Title, if applicable)
____________________	____________________
(Company Name)	(Land/Company Name)
____________________	____________________
(Mailing Address)	(Mailing Address)
____________________	____________________
(Telephone Number)	(Telephone Number)

Appendix H
EC and SAR Tables

Appendix H

Specific Electrical Conductivity (EC as uS/cm) and Sodium Adsorption Ratio (SAR) Values Proposed for the Tongue, Powder, and Little Powder River Basins and Adopted for the Cheyenne and Belle Fourche River Basins

Wyoming currently implements its narrative water quality standard through its NPDES permitting program. Implementation is on a watershed basis, with DEQ setting permit limits that are determined to be protective of downstream irrigated agriculture. Wyoming, therefore, does not have specific numerical standards for SAR and EC at this time. Nevertheless, numerical standards of downstream jurisdictions apply and may have an affect on discharges in Wyoming. The SAR and EC values in this table are: 1) those adopted by the Northern Cheyenne Tribe and the specific values proposed by the parties to the Montana water quality standards process now underway; and 2) those adopted, as statewide standards, by South Dakota. None of the numerical values applicable to the Tongue, Powder, and Little Powder in Montana has final Clean Water Act (CWA) status, and it is not certain, at this point, what the final CWA values applicable to these Rivers will be. Nevertheless, these SAR and EC values were developed with assistance from advisors with expertise in the area of salinity and sodicity effects on irrigated agriculture. Therefore, it would not be unreasonable to view these values as providing a fair estimate of the range of SAR and EC values which may eventually be judged as providing an appropriate level of protection for irrigated agriculture in these basins. The numerical standards applicable to the Cheyenne and Belle Fouche Rivers in South Dakota are final standards with CWA status. The values are presented here simply to provide the reader with easy link to the standards development process now underway in Montana and the South Dakota water quality standards.

Specific EC and SAR Values Under Consideration in the Montana Water Quality Standards Process

Montana DEQ Option 1

	Irrigation Season (4/1–10/31)	Non-Irrigation Season (11/1–3/31)	Criteria Applicable All Year to All Waters		Notes
Watershed	EC (max)	EC (max)	SAR (max)	SAR (abs. max)	SAR(max) is the SAR calculated using the ambient EC, for a specific sampling event, in the equation. The calculated SAR is a maximum. SAR(abs. max) is a maximum, not to be exceeded, value that applies to all waters at all times and is based on protecting against the rain-on-sodic-soil event. SAR(abs. max) is 0.5 where EC is less than 350. Although specific numeric standards for EC and SAR (as prescribed in this table) have been proposed, Montana's Option 1 proposal includes a range of potential values that could be considered for adoption by the Board. For SAR, the range is 1 – 10. For EC, the range is 350 – 2,500.
Tongue River	1,000	2,000	EC x 0.0071–2.475	5.0	
Tributaries to the Tongue River	500				
Powder River	1,900				
Tributaries to the Powder River	500				
Little Powder River	1,900				
Tributaries to the Little Powder River	500				

Montana DEQ Option 2

This option is the same as option 1, except for the Tongue River. For the Tongue River, the standards progressively become more stringent from downstream to upstream. This is to protect assimilative capacity in the Montana portion of the River, ensuring the desired level of water quality is attained at the mouth of the River while allowing for development in the upper section of the basin.

	Irrigation Season (4/1–10/31)	Non-Irrigation Season (11/1–3/31)	Criteria Applicable All Year to All Waters		Notes
Watershed	EC (max)	EC (max)	SAR (max)	SAR (abs. max)	
Tongue River (Yellowstone R. – N. Cheyenne, northern boundary)	1,000	2,000	EC x 0.0071–2.475	5.0	SAR(max) is the SAR calculated using the ambient EC, for a specific sampling event, in the equation. The calculated SAR is a maximum. SAR(abs. max) is a maximum, not to be exceeded, value that applies to all waters at all times and is based on protecting against the rain-on-sodic-soil event. SAR(abs. max) is 0.5 where EC is less than 350. Although specific numeric standards for EC and SAR (as presented in this table) have been proposed, Montana's Option 2 proposal includes a range of potential values that could be considered for adoption by the Board. For SAR, the range is 1 – 10. For EC, the range is 350 – 2,500.
Tongue River (N. Cheyenne, northern boundary – southern boundary)	900				
Tongue River (N. Cheyenne, southern boundary – reservoir inlet)	700				
Tongue River (reservoir inlet WY border)	600				
Tributaries to the Tongue River	500				
Powder River	1,900				
Tributaries to Powder River	500				
Little Powder River	1,900				
Tributaries to the Little Powder River	500				

Petitioners[1] *Proposal*

This proposal is similar to DEQ's option 2 in that there are multiple standards for each river and the standards become progressively more stringent from downstream to upstream. This proposal also includes multiple irrigation periods at certain locations.

River Segments and Compliance Locations	EC (max)	SAR (max)	Notes
Tongue River - Wyoming state line	600	0.5	Applicable dates: all year
Tongue River – Reservoir	800	1.0	Applicable dates: all year
Tongue River - at conf. w. Yellowstone R.	1,000	1.6	Applicable dates: 4/1 - 10/31
Tongue River - at conf. w. Yellowstone R.	1,200	2.5	Applicable dates: 11/1 - 3/31
Powder River – Moorhead	1,400	4.0	Applicable dates: 4/15 - 7/15
Powder River – Moorhead	2,200	5.0	Applicable dates: 7/16 - 9/1
Powder River – Moorhead	3,000	6.0	Applicable dates: 9/2 - 4/14
Powder River - at conf. w. Yellowstone R.	1,600	4.0	Applicable dates: 4/15 - 7/15
Powder River - at conf. w. Yellowstone R.	2,400	5.0	Applicable dates: 7/16 - 9/1
Powder River - at conf. w. Yellowstone R.	3,200	6.0	Applicable dates: 9/2 - 4/14
Little Powder - Biddle	2,000	5.0	Applicable dates: 4/15 - 7/15
Little Powder - Biddle	2,400	6.0	Applicable dates: 7/16 - 9/1
Little Powder - Biddle	3,000	8.0	Applicable dates: 9/2 - 4/14

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[1] "Petitioners" include -Tongue River Water Users, T&Y Irrigation District, Buffalo Rapids Irrigation Project, and Northern Plains Resource Council.

WQS for Electrical Conductivity (EC) and Sodium Adsorption Ratio (SAR) Adopted by the Northern Cheyenne Tribe

The Northern Cheyenne Tribe's EC and SAR numerical standards were adopted by the Tribal Council on May 28, 2002. The numerical standards apply to the Tongue River and tributaries within the boundaries of the Reservation.

Tongue River (within the Reservation Boundaries)	Irrigation Season (4/1 – 11/15)	Criteria Applicable All Year		Notes
	EC (30-day ave.)	EC (inst. max.)	SAR (inst. max.)	The Tribe has also adopted indicator values for total dissolved solids (TDS) that will be used to monitor conditions and trends of these waters.
Southern Boundary	1,000	2,000	2.0	
Northern Boundary	1,500	2,000	3.0	
Tributaries	1,500	2,000	3.0	

WQS for Electrical Conductivity (EC) and Sodium Adsorption Ratio (SAR) Adopted by South Dakota

Watershed	Criteria Applicable All Year			Notes
Belle Fourche and Cheyenne Rivers and tributaries	EC (30-day ave.)	EC (daily max)	SAR (daily max)	
	$\leq$ 2,500	$\leq$ 4,375	$\leq$ 10	

Appendix I
Water Management Plan

Appendix I — Water Management Plan

The following section describes the requirements for a Water Management Plan, which is needed for individual coal bed methane (CBM) well APDs or multiple well PODs. Additional technical support information for WMPs is currently being developed by BLM as part of the revision of the *Buffalo Field Office CBM APD and Project POD Preparation Guide.*

The operator shall provide a comprehensive water management plan (WMP) that addresses the handling of produced water during the testing and production of coal bed methane (CBM) well(s). The WMP must provide adequate information for the BLM to complete NEPA analysis and to ensure compliance with all state and federal requirements prior to approval. A CBM APD/POD will not be considered complete or processed by BLM unless it contains a WMP.

REQUIREMENTS FOR WMPS:

1. The WMP must include a statement that the operator will comply with all laws, standards and criteria set forth by all appropriate Federal, State and Local authorities including Wyoming State Engineers Office (WSEO), Wyoming Department of Environmental Quality (WDEQ), Wyoming Oil and Gas Conservation Commission (WOGCC), BLM, Environmental Protection Agency (EPA) and U.S. Army Corps of Engineers (Corps).

2. The WMP will be submitted concurrently as an addendum to the APD/POD or as a section within the POD Surface Use Plan under item No. *12. Other Information.*

3. A WMP map will be required. For the map identify discharge points, watershed boundaries, reservoirs, infiltration pits, low water crossings, head-cuts and other erosion features, land application disposal areas, water and gas pipelines, spring locations, wells, roads, POD boundary, and other info necessary to adequately evaluate the WMP.

   - Submit Four copies of the Water Management Plan Map. If changes are made as a result of the onsite or because of operator revisions, four copies of each of final maps will be required.
   - For smaller PODs or where clutter is not an issue, maps may be combined into one master map (four copies needed)

4. A representative water quality analyses, performed within the last six months, will be included for each targeted coal zone on lease. Samples should be from the closest source possible within the Township and Range of the proposed action (maximum distance 6 miles).

   Constituents analyzed in the water quality analyses will be the same as those required by the Wyoming Department of Environmental Quality (DEQ) for the National Pollutants Discharge Elimination System (NPDES) permit using approved Environmental Protection Agency (EPA) test procedures (40 CFR 136 or 40 CFR136.5). The list of constituents and detections limits can be found following in Appendix WMP 1.

   The first well drilled to each targeted coal zone will become the designated reference well. Designated reference wells must have the ability to be sampled at the wellhead. Water samples will be collected for analysis within 30-60 days of initial pumping. Results of the analysis will be submitted to the BLM Authorized Officer as soon as they become available.

5. Plans and designs for the erosion control and stabilization measures for minor head-cuts, eroding channel sections, etc., must be provided. In-channel mitigation measures must be designed to

accommodate existing and proposed discharges, in addition to naturally occurring flow. Engineering diagrams for erosion control and stabilization measures for major areas of improvement will be required, at BLM's discretion, on a site-specific basis. BLM may require notification prior to any activity crossing a waterway of the state, in order to ensure compliance with USCOE General Permit 98-08.

6. All WMPs must include a Lessee's or Operator's Representative and Certification as follows:

I hereby certify that I, or persons under my direct supervision, have inspected the watershed area(s) affected by our coal bed methane drilling and production plans; that I am familiar with the conditions which currently exist; that the statements made in this plan are, to the best of my knowledge, true and correct; and that the work associated with operations proposed herein, including construction, monitoring and reclamation activities will be performed by ________________________ and its contractors and subcontractors in conformity with this plan and the terms and conditions under which it is approved. This statement is subject to the provisions of 18 U.S.C. 1001 for the filing of a false statement.

Date ________________ *Name and Title* ______________________________________

If the WMP is prepared by the same entity and submitted as part of the POD Master Surface Use Plan or APD Surface Use Plan, then the Certification Statement already required under APD Item 13 of the Surface Use Plan will suffice.

7. A completed *Hydrologic Watershed Field Analysis Summary Sheet* for each watershed evaluated for the POD area will be submitted with the WMP. This information must be based on field reconnaissance and must include the following:

a. Watershed area
b. Average watershed slope
c. Existing channel (average slope, width, depth, condition, etc.) and calculation of mean annual flow
d. Peak flow analysis (2-, 10-, and 25-year return interval at a minimum)
e. Destination (i.e., tributary to the Belle Fourche River)
f. Description of the existing watershed including:
    i) Existing wells (location, depth, water level, use, condition)
    ii) Existing impoundments (location, size, volume, use, condition, description of outlet works and spillway)
    iii) Road crossings (crossing type - culvert, low water crossing, bridge, etc. and condition)
    iv) Water related uses (irrigation, livestock, industrial uses, etc.)
    v) Potential down stream concerns (on- channel impoundments, hay meadows, coal mine reclamation and sediment structures, unimproved channel crossings, etc.) and plans to mitigate impacts caused by discharge of produced water.

Hydrologic Watershed Field Analysis Summary Sheet

POD Name:

Company:

Watershed involved

Watershed Area :

Average Watershed Slope, ft./mi.:

Existing Channel information

Average Bank Full Width, ft.

Average Channel Slope, feet/foot

Average Channel Width, ft. and Depth, ft.

General Channel Condition: Stable/Unstable (potential erosion areas of concern)

Proposed Channel Improvements

Area of Headcut Modification, square feet: acres:

Area of Pipeline or utility corridor channel crossing, square feet: acres:

Area of Low Water Crossings, square feet: acres:

Area of other channel modifications (describe by type): acres:

Channel Vegetative Cover/ Dominant Species:

Peak Flow Analysis (Describe methods used for calculations and provide values used as variables)

Recurrence Interval (Years)	Exceedence Probability(%)	Peak Flow	Peak Flow for Complete Basin (CFS)
2	50		
5	20		
10	10		
25	4		

8. Include in either the WMP or item # 3 of the surface use plan for the POD, a list of all the wells permitted through the WSEO within a one-mile radius of the producing wells and water management structures in the project area.

9. A table listing the culverts (existing and proposed) in the development area, including the location (GPS coordinates (Latitude/Longitude, or Northing/Easting)), size (diameter and length), area of in-channel disturbance, drainage area above the culvert, condition of existing culverts and the anticipated maximum flow, including CBM discharge, through the culvert based on a 10-year flood without development of static head at the entrance.

10. A table listing the low water crossings (existing and proposed) in the development area, including the location (GPS coordinates (Latitude/Longitude, or Northing/Easting)), area of in-channel disturbance, drainage area above the crossing and the anticipated maximum flow, including CBM discharge, through the crossing based on a 10-year flood.

11. A table listing the CBM water discharge points (existing and proposed), including location (GPS coordinates (Latitude/Longitude, or Northing/Easting)), all wells contributing to discharge at each point, estimated maximum flows, and NPDES number as available. Access routes to discharge points must be described in the project WMP and identified on the map.

12. A table listing the headcuts, sidecuts or other erosional features in the development area, including the location (GPS coordinates (Latitude/Longitude, or Northing/Easting)), size (diameter and length), area of in-channel disturbance, and proposed mitigation.

13. A table listing reservoirs (existing and proposed), including the location, capacity, embankment-height, top width, crest length, upstream and downstream slope, condition, description of low-level outlet (agri-drain), spillway, hydrologic characteristics and an accounting of the disturbed area. Access routes to reservoirs must be described in the project WMP and identified on the map.

14. If part of the water management strategy includes Land Application Disposal (LAD), additional information regarding the site location, application rate and method, soil chemistry and characteristics, and monitoring program will be required. For additional information, refer to the Land Application Guidance in Appendix WMP 3.

15. The description of the proposed maintenance and monitoring program. Include monitoring frequency and maintenance plans for discharge points, reservoirs, culverts, channel crossings, other water control structures, erosional features (including headcuts) and stream channels. Additional information regarding a monitoring plan is found Appendix WMP 4.

16. All potential downstream concerns or impacts will be identified, documented and mitigation proposed.

17. Prior to abandonment of facilities associated with the WMP, the operator will submit, via Sundry Notice (Form 3160-5) site-specific reclamation plans for BLM review and approval. Phased reclamation (i.e., reclaim individual facilities as they are no longer necessary) will be expected. Any activities outside the approved proposed actions will require authorization by the BLM Authorized Officer.

18. Some investigations required for WMP preparation may require on-site data collection for the proposed project area. Operator should contact the Buffalo Field Office of the BLM for authorization prior to commencement of any activities associated with data collection.

19. Documentation that all proposed new and modifications to existing on-channel CBM water containment structures will be done in conformance with and are properly permitted (or are in the process of being permitted) through the WSEO (and the USCOE if necessary). If the structure is on Federal surface, it must also meet criteria set forth by the BLM State Engineer. For additional guidance regarding on-channel containment structures, please refer to Appendix WMP 4.

20. Documentation that all proposed off-channel CBM water containment structures meet the siting criteria as outlined in the Guidelines for Off-Channel CBM Water Containment Structures located in Appendix WMP 5. If the structure is constructed on Federal surface, it must also meet design criteria set forth by the BLM State Engineer.

21. A bond will be required for each off-channel water containment structure associated with a Federal Lease, the details of which will be based on site-specific conditions.

22. Operators will be requested to submit project maps electronically using geographic information system (GIS) software.

General Guidance

- Consult private surface owner(s) early in the planning process and throughout the development of water management plans WMPs.
- Develop WMPs on a sub-watershed basis, coordinating with other companies within the same sub-watershed.
- Consider all upstream contributions (natural flow, runoff and other discharges) and determine through sound hydrologic analysis if the produced CBM water from the wells (based on known or anticipated water production rates) will adversely impact downstream improvements, uses, and users (reservoirs, hay ground, etc.).
- Depending on the water quality and quantity, it may be beneficial to consider centralizing the water discharge to localize the associated disturbance.
- Consider innovative methods of using produced CBM water. Any method recommended will be evaluated and authorized on a case-by-case basis.
- Locate discharge points and reservoirs in readily accessible areas for ease of installation and monitoring. Also, consider access options which involve the least surface disturbance in any erosion feature modification design.
- Select designated reference well locations so that they will be easily accessible year-round for sampling.

Discharge Points

- Locate discharge points in areas that will minimize erosion and impacts to the receiving channel, existing improvements, and downstream users.
- Do not locate discharge points on hilltops or upland areas unless diecharge is to an approved water containment structure. Insure that they are located in stable, low gradient drainage systems and below active head cuts.
- Locate discharge points below any potentially active headcuts whenever possible. If discharge must be made above a headcut, mitigation will be required by the BLM Authorized Officer, including engineered remediation on a site-specific basis.
- Design proper energy dissipation measures for discharge outlets (e.g., vertical culvert with rip-rap, splash pad, laydown pipe with French drain on rip-rap pad, etc.)
- Discharge locations will not be authorized by BLM unless they are in an environmentally sound location, regardless of NPDES status or previous use. Sites may be moved or otherwise mitigated by the BLM Authorized Officer during onsite inspections where environmental issues exist.

- Cumulative produced water discharge must not exceed the naturally occurring mean annual peak flow of the receiving channel.
- Do not locate discharge points in playas or enclosed basins unless it can done in an environmentally sound manner without resulting in adverse impacts. Discharges into valley bottoms with no defined low-flow channel will generally not be authorized, but will be reviewed on a site-specific basis.
- Minimize channel disturbance as much as possible by limiting pipeline and access crossings. Avoid running pipelines and access roads within floodplains, parallel to the channel.

Water Containment Structures

- Reservoirs must be designed in accordance with WSEO standards to accommodate the proposed as well as potential upstream development. For on-channel reservoirs, refer to the guidance located in Appendix WMP 4.
- Locate off-channel pits so that there will be no negative impact on the adjacent surface, surface water or groundwater. Refer to Appendix WMP 5.
- Discharges to existing and proposed impoundments must be in compliance with all WSEO, COE and BLM requirements.
- Reservoirs: See Appendix 4 and 5 in the following section for specific guidance regarding both on-channel reservoirs and off-channel pits.
- If passage of water through a spillway is to be frequent, the spillway must be reinforced and designed for continual flow (regular flows on earthen spillways will not be allowed).

Appendix WMP 1 – Water Quality Analysis Criteria

Constituent	Detection Limits
Expected Flow volume from each well:	gallons per day
Total dissolved solids:	5 mg/l (milligrams per liter)
pH:	0.1 standard units
Sulfates:	10 mg/l
Chlorides:	5 mg/l
Specific conductance:	5 micromhos/cm
Total radium 226:	0.2 pCi/l (picoCuries/liter)
Total petroleum hydrocarbons[1]:	1 mg/l
Total[2] Aluminum:	50 µg/l (micrograms per liter)
Total Antimony:	5 µg/l
Total Arsenic:	0.1 µg/l
Total Barium:	100 µg/l
Total Beryllium:	0.03 µg/l
Dissolved[3] Cadmium:	0.1 µg/l
Dissolved Chromium:	1 µg/l
Dissolved Copper:	1 µg/l
Total Cyanide:	5 µg/l
Dissolved Iron	30 µg/l
Dissolved Manganese:	10 µg/l
Dissolved Nickel:	10 µg/l
Dissolved Lead:	2 µg/l
Dissolved Mercury:	0.06 µg/l
Phenol:	10 µg/l
Total Selenium:	5 µg/l
Dissolved Silver:	3 µg/l
Total Thallium:	10 µg/l
Dissolved Zinc:	10 µg/l
Total Hardness:	10 mg/l as $CaCO_3$
Dissolved Sodium:	1 mg/l
Dissolved Magnesium:	1 mg/l
Dissolved Calcium:	1 mg/l
Dissolved Boron:	0.1 mg/l
Bicarbonate:	1 mg/l
Dissolved Fluoride:	0.1 mg/l
Dissolved Potassium:	1 mg/l
Total Alkalinity:	1mg/l as $CaCO_3$
Sodium Adsorption Ratio:	not applicable

[1] Acceptable methods for analyzing total petroleum hydrocarbons are 418.1 in the latest edition of Standard Methods for the Examination of Water and Wastewater and EPA SW846 Method 8015 (modified) for Total Extractable Petroleum Hydrocarbons.

[2] Value is expressed in terms of total recoverable metal in the water column.

[3] Volume is based on the dissolved amount, which is the amount that will pass through a 0.45 µm filter prior to acidification to pH 1.5 - 2.0 with nitric acid.

NOTE: Except for the aquatic life values for metals and where otherwise indicted, the values given refer to the total recoverable (dissolved plus suspended) amount for each substance. For the aquatic life values for metals, refer to the dissolved amount.

Appendix WMP 2 – Monitoring Plan Requirements

Monitoring Plans must include the following as a minimum:

- The operator will be responsible for monitoring discharge point(s) on a monthly basis for the first year of operation. Inspectors will note the condition of each discharge point, check for evidence of erosion, and schedule any necessary mitigation work. Records of the inspections will be made available to the BLM Authorized Officer upon request.

- Dam outlets (spillways and pipes) and culvert outlets will be inspected quarterly, or after major storm events for the first year of operation. Inspectors will note the condition, check for evidence of erosion, and schedule any necessary mitigation work. A reservoir maintenance program will be included to address storage capacity management. Records of the inspections will be made available to the BLM Authorized Officer upon request.

- Erosion stabilization measures (head cut repairs, etc.) will be inspected on a monthly basis for the first year of operation, for signs of erosion or structure failure. Inspectors will note condition and schedule any necessary mitigation work. Records of the inspections will be made available to the BLM Authorized Officer upon request.

- Downstream channels (below the well(s)/project area) will be inspected on a monthly basis for signs of accelerated erosion due to the continuous flow of produced water for the first year of operation, which includes low water crossings. Records of the inspections will be made available to the BLM Authorized Officer upon request.

- Any mitigation work, repairs or other maintenance which involves actions or surface disturbance outside the scope of the initially authorized action will require approval by the BLM Authorized Officer prior to the initiation of any work. The proposed actions will be submitted as a Sundry Notice to the Buffalo Field Office of the BLM.

- An access agreement for BLM monitoring will be included with the WMP for the lease area.

- After the first year of operation, inspections will occur annually unless specific sites have required mitigation action, then inspections will continue at the previous intervals until no action has been required for a full year. Records of the inspections will be made available to the BLM Authorized Officer upon request.

Appendix WMP 3 – Land Application Disposal Guidance

The consideration of LAD as a beneficial use of CBM produced water can only be determined after an extensive evaluation of the land application operation has been completed. Many environmental factors must be assessed to determine both the potential risk and potential benefits for land application to be considered a viable option for disposal of discharge water. The best management practices for land application will be an evolving process as new research, data, and processes become available. The operator is strongly encouraged to consult with the BLM specialists early in the development of the water management plan.

Land application disposal of produced water has the potential to produce negative, long term impacts to soil physical and chemical properties if not properly managed. Proposals to land apply CBM produced water of federal projects must include the following.

1. Site selection: Should include a general description including, but not limited to, slope, aspect, elevation and local climatic limitations. Detailed existing vegetation composition and canopy cover by species, percent bare ground, and any erosion or soil compaction features.

2. Site Characterization: The site characterization must include comprehensive field investigations of soils and vegetation. The site will be described in detail and soil samples will be collected and analyzed to determine important soil chemical and physical properties. Site descriptions should include maps, vegetation descriptions, detailed soil profile descriptions, laboratory analysis and location of proposed application disposal sites. Photo documentation of the site should be included. Laboratory analysis of the produced water should also be included with the site characterization study.

3. Project description: The project description must include the proposed method(s) of water application disposal, application rates and schedules and physical layout of application disposal areas. Complete maps of the application infrastructure should be included. Detail any soil or water amendments which will be utilized or physical soil manipulation which are planned. Project descriptions should demonstrate that land application disposal is feasible given the results of the site characterization.

4. Monitoring Plan: Periodic monitoring of soils and vegetation will be required to assure that negative impacts are not occurring or are being remediated. Monitoring must include soil sampling and laboratory analysis.

5. Winter Operations: Detail Practices which will be used to prevent the buildup of ice on the soil surface during sub freezing temperatures.

6. Mitigation Plan: A plan must be developed which outline mitigation measure which will be implemented in the event negative soils or vegetation impacts are deleted during routine monitoring. Potential mitigation measures might include soil or water amendments, physical manipulation or vegetative treatments.

These criteria are general in nature, and must be adjusted to site specific conditions. Detailed soil sampling criteria have not yet been developed, so project proposals will be evaluated on a case by case basis during the interim.

The effectiveness of a LAD system will depend on many things including. The soil types involved and there associated physical and chemical properties. The method of application will help identify the site, water delivery efficiency, leaching requirements and surface salt accumulations. The water quality of the CBM produced water will determine the feasibility of application but also the predicted environmental effects as well as determine the effectiveness of chemical and organic amendments need for mitigation.

Appendix WMP 4 - On-Channel CBM Water Containment Structures

For on-channel CBM water containment structures on BLM surface lands that are proposed as part of the WMP, the operator must provide the following information for review by the BLM State Engineer:

1. For each on-channel (CBM) water containment structure smaller than 20 acre-feet capacity and with a dam height of less than 20' (20/20), the operator must include in the WMP the information that would normally be required by the SEO for a stock water reservoir permit. This information would need to clearly show that each on-channel CBM water containment structure is being constructed using BLM specifications for earthwork placement and principle spillway configuration. After a case-by-case consideration of the factors below (a. and b.), BLM would either approve or disapprove each on-channel CBM water containment structure. Upon approval by the BLM, the operator would then need to have each on-channel CBM water containment structure permitted by the SEO.

2. For on-channel (CBM) water containment structures greater than 20/20, the permit application must be submitted to the BLM as part of the WMP with the information that would be normally required for permitting by the SEO. If approved by the BLM State Engineer at the Wyoming State BLM office, the operator would then be required to submit an application to the SEO for approval under the Safety of Dams program.

   On-channel CBM water containment structures on BLM surface will be approved or disapproved on a case-by-case basis after considering the following factors:

   a. Proper siting and design.
   b. Existing resource uses/needs and multiple-use management principles.

   Please be advised that BLM will apply special *Conditions-of-Approval* to authorized on-channel CBM water containment structures depending upon case-by-case consideration of the above-factors. Construction monitoring by BLM Authorized Officers would also be required on a case-by-case basis.

3. Water production rates (for each discharge point and CBM flows into the water containment structure) must be disclosed including discharge schedule (initial, intermediate, and final rates and duration) and maximum, mean, and minimum anticipated rates.

Appendix WMP 5 - Off-Channel CBM Water Containment Structures

Guideline approved by Water and Waste Advisory Board Page 1
October 1, 2002
Wyoming Department of Environmental Quality
Water Quality Division
August 6, 2002
"Off-channel, Unlined CBM Produced Water Pit
Siting Guidelines for the Powder River Basin, Wyoming"

BACKGROUND AND OBJECTIVES

The WDEQ/Water Quality Division has worked with other state and federal agencies to develop recommendations to be implemented through various regulatory mechanisms for evaluating and siting CBM produced water pits. The recommendations call for CBM operators to collect hydrogeologic information at each site to determine the following:

1) The classification of shallow, unconfined groundwater (where present) as determined from existing use or ambient quality, or both, in accordance with Chapter 8 of WDEQ's Water Quality Rules and Regulations.
2) Ability of the produced water to diminish the use (i.e. suitability) of shallow, unconfined groundwater (where present).
3) Ability of the produced water to re-surface, or reach surface waters.
4) Ability of the produced water pit to infiltrate into the subsurface.

The evaluation of the placement of the unlined CBM produced water pits should be conducted before the construction of the pits. Any questions about the final placement of the unlined CBM produced water pits should be clarified with the WDEQ/WQD before submitting a permit application to the WDEQ/NPDES program or Wyoming Oil and Gas Conservation Commission.

In addition to the evaluations listed below, more information and assessment may be needed when attempting to evaluate potential impacts from large (e.g. $ 5 acres) or deep infiltration pits, or pits proposed in potentially vulnerable areas. Examples of these areas would include: environmentally sensitive areas such as wetlands, areas with multiple domestic wells such as a rural subdivision, wellhead protection or source water protection areas, and areas near public drinking water supply wells. In some situations, monitoring programs may be needed to measure and assess the movement and fate of leachate from infiltration pits and/or the effects, if any, upon groundwater and surface water quality. Where unlined pits cannot be allowed operators should consider the use of alternative disposal methods. Surficial geology data on the Powder River Basin is available from the Wyoming State Geological Survey and will aid in siting unlined CBM produced water pits.

PROXIMITY TO "SURFACE WATERS OF THE STATE"

Discussion:

Surface waters of the state means all perennial, intermittent, and ephemeral defined drainages, lakes, reservoirs and wetlands which are not man-made retention ponds used for the treatment of municipal, agricultural or industrial waste; and all other bodies of surface water, either public or private, which are wholly or partially within the boundaries of the state as defined in Water Quality Rules and Regulations, Chapter 1 Because the off channel produced water pits may be allowed to leak into the subsurface, there must be reasonable assurance that there is no direct subsurface hydrologic connection between the produced water pits and surface waters of the state.

In order to protect the surface waters of the state, produced water pits should be located one-quarter mile (1320 feet) from the outermost alluvium (and adjacent mixtures) of any current stream system and, at a minimum, five hundred (500) feet from the edge of any bank-to-bank stream channel, pond, reservoir, wetland or lake.

Note: 1:100,000 scale surficial geology maps produced by the Wyoming State Geological Survey and the USGS are available for some areas of the Powder River Basin (see attached list) and are to be used in identification of alluvial deposits. In unmapped areas alluvial deposits must be identified by field investigation. USGS 1:24000 scale topographic maps can be used to aid in determining off channel pit locations. Solid blue lines illustrate perennial streams; dashed blue lines illustrate intermittent streams. Ephemeral streams are not uniquely defined on USGS topo maps, however, major ephemeral drainages are included with the intermittent drainages. The dashed blue lines may suffice for illustrating ephemeral streams with a bank to bank channel; however, additional field investigation may be necessary to determine if the map symbol accurately depicts field conditions. For any pit proposed to be located within one-quarter mile (1320 feet) from the outermost alluvium (and related mixtures) of any current stream system and/or within five hundred (500) feet from the edge of any bank-to-bank stream channel, pond, reservoir, wetland, or lake evidence should be presented that demonstrates that there will be no direct hydrologic connection from the unlined CBM produced water pit to surface waters of the state, or to areas outside of the pit. The evidence may be in the form of a subsurface investigation, modeling that utilizes site specific parameters, or other evidence (e.g., groundwater gradient) that protects surface waters of the state.

PROXIMITY TO DOMESTIC WATER SUPPLY WELL (PROTECTION OF GROUNDWATER WHERE THERE IS DOMESTIC USE)

Discussion:

Groundwater is classified by either the current use (i.e. domestic, agricultural, livestock, etc.) or the ambient quality of the groundwater (where there is no use). Where groundwater is being used for domestic purposes it will be protected to Class I standards. That is, concentrations of inorganic, metal, and other analytes within the groundwater must remain within the domestic class of use suitability standard. Groundwater can be Class I "by use" even when concentrations of one or more analytes within it exceeds Class I suitability standards. In this case, concentrations of analytes within the groundwater cannot exceed the domestic class of use suitability standard unless the ambient concentration is greater than that standard. For those analytes whose ambient concentrations are less than the domestic class of use suitability standard, limited degradation is allowed but only to the point that concentrations do not exceed the standard. Groundwater classifications are discussed in Water Quality Rules and Regulations, Chapter 8.

Unlined CBM Produced Water Pits Located Within 1/4 Mile of Any Domestic Use Well:

In order to provide protection for an aquifer that is currently being used for a domestic water supply, the department recommends that the operator should not attempt to locate an unlined CBM produced water pit within 1/4 mile of a domestic use well. If an unlined CBM produced water pit is to be located with 1/4 mile of a domestic use well, the following information should be developed:

1) The operator should demonstrate that the water quality being discharged into the unlined CBM produced water pit is of equal or better quality than the groundwater being utilized in the domestic use well. (Please see discussion above regarding groundwater class of use and protection.)
2) The operator should demonstrate that the domestic use well will not be impacted (i.e., the domestic use well is located upgradient or cross-gradient from the unlined CBM produced water pit) and that the class of use of groundwater will not be impaired.
3) The operator should demonstrate that the aquifer in which the domestic use well is screened is of sufficient depth or confinement such that any water infiltrating from the unlined CBM pit will not reach the aquifer. Information about the construction details of the domestic use well should be presented to ensure that a proper annular seal exists to prevent vertical migration of water down the well bore.

If none of these three conditions can be met, the unlined CBM produced water pit should not be located within 1/4 mile of a domestic use well.

PROXIMITY TO STOCK AND IRRIGATION WELLS (PROTECTION OF GROUNDWATER WHERE THERE IS NON-DOMESTIC USE)

Discussion:
In order to protect groundwater that may be suitable for domestic use, any stock and irrigation well that is within 1/4 mile of the produced water pit shall be sampled for Table 1 parameters in order to determine ambient quality of the shallow aquifer, unless it can be shown by State Engineer's Office records or field measurements that the well is not completed within the shallow aquifer.

Groundwater from stock and irrigation wells may be classified as Class I (i.e., domestic) by ambient quality and must be protected as such. If the groundwater is designated as Class I by ambient quality, the recommendations of the following section on siting pits within areas of potentially high quality groundwater should be applied.

If the ambient quality of the groundwater from a non-domestic well is equal to, or less than the quality of the CBM produced water, no restrictions would apply.

LOCATION OF PITS WITHIN AREAS WITH POTENTIALLY HIGH QUALITY SHALLOW AQUIFERS (PROTECTION OF GROUNDWATER WHERE THERE IS NO USE)

Discussion:
*In order to protect groundwater that may be suitable for domestic use, where a CBM produced water pit is proposed to be located within areas where Total Dissolved Solids (TDS) concentrations of groundwater within the Wasatch/Fort Union formations are depicted as < 500 mg/L, the groundwater shall be sampled for Table 1 parameters in order to determine ambient quality of the shallow aquifer.**

If the groundwater is designated as Class I by ambient quality an unlined CBM produced water pit may be allowed if it can be demonstrated that the water quality being discharged into the unlined CBM produced water pit is of equal or better quality that the groundwater.

If this condition cannot be met, the unlined CBM produced water pit should not be located within that area, or an acceptable, alternative disposal method used. If the ambient quality of the groundwater is equal to or less than the quality of the CBM produced water no restrictions would apply.

- **Note:** WDEQ recommends the use of *Dissolved Solids Map of Wasatch/Fort Union Aquifer System Water, Powder River Basin, Wyoming* from Volume I-B, *Occurrence and Characteristics of Ground Water in the Powder River Basin, Wyoming*, Water Resources Research Institute, University of Wyoming, 1981. An updated, similar map is currently under development by the Wyoming State Geological Survey and USGS and should be used when completed.

PROXIMITY TO CLINKER/SCORIA DEPOSITS

Discussion:
Large clinker deposits are present in various areas of the Powder River Basin. The clinker deposits can be a highly permeable deposit with high groundwater flow velocities due to fracture flow. Clinkers deposits are known to contain high quality aquifers in some areas. 1:100000 scale surficial geology maps illustrating locations of clinker deposits are available from the Wyoming State Geological Survey. Site specific analysis may be needed in potentially vulnerable areas.
In order to protect groundwater and surface water quality, no unlined pit should be located on or within 500 feet of a clinker deposit without consideration of the following information:

1) Analysis of the clinker groundwater aquifer or any existing springs associated with the clinker should be classified according to Table 1 groundwater parameters and;
2) Surface and subsurface extent of clinker deposit, groundwater flowpaths, and the ability of infiltrated pit water to migrate to "surface waters of the state".

Pits can be located on a clinker deposit or within 500 feet of a clinker deposit only if:

1) Analysis of groundwater demonstrates that the aquifer is of equal or lesser quality than the CBM water discharged into the pit, **and**
2) It can be demonstrated that the water infiltrating through the clinker will not reach "surface waters of the state".

PROXIMITY TO SPRINGS

Discussion:
Springs shall be afforded the same protection as groundwater. In order to protect waters of the state, no produced water pit should be sited within 1/4 mile of any spring unless the following can be documented:

1) The water quality of the spring is determined to be of equal or lesser quality than the CBM water being discharged into the pit. This determination is based upon groundwater classification parameters in Table 1; or
2) The spring is determined to be up-gradient or cross gradient from the pit.

If a pit is to be placed within 1/4 mile of a spring that has been determined to be of better quality water than the CBM discharge water evidence must be presented to demonstrate that the spring will not be impacted, or a monitoring program approved by WDEQ must be implemented.

Table 1: Classification Analytes1

Arsenic	Calcium	Chromium	Iron
Fluoride	Barium	Sodium	Lead
Cadmium	pH	Boron	Chloride
Potassium	SAR2	Sulfate	Dissolved Solids
Magnesium	Total Selenium	Copper	Zinc

1 The listed parameters shall be analyzed in the laboratory for "total" concentrations.

2 Sodium Absorption Ratio (SAR): SAR is a calculated number involving the ratio of sodium, calcium and magnesium ions. The number is derived to predict the degree to which irrigation water tends to enter into cation exchange reaction with soil. High values of SAR can be damaging to soil structure. The Class II (agricultural) standard for SAR is eight (8). There is no Class I (domestic) or Class III standard for SAR. Therefore, if the producing groundwater is classified as a Class I or Class III aquifer, the concentrations of sodium, calcium, and magnesium (components of SAR) will not be allowed to degrade an underlying Class II aquifer beyond its class of use.

WYOMING STATE GEOLOGICAL SURVEY GEOLOGIC HAZARDS SECTION DIGITAL MAPS (HSDM)

PUBLISHED DIGITAL SURFICIAL GEOLOGIC MAPS

HSDM 98-1 Preliminary 1:500,000-scale digital surficial geology map of Wyoming

HSDM 98-3 Preliminary digital surficial geologic map of the Casper 30' x 60' Quadrangle, Natrona and Converse Counties, Wyoming

HSDM 98-4 Preliminary digital surficial geologic map of the Cheyenne 30' x 60' Quadrangle, southeastern Wyoming, western Nebraska, and Northern Colorado

HSDM 98-5 Preliminary digital surficial geologic map of the Laramie 30' x 60' Quadrangle, Albany and Laramie Counties, Wyoming

HSDM 98-6 Preliminary digital surficial geologic map of the Rawlins 30' x 60' Quadrangle, Carbon and Sweetwater Counties, Wyoming

HSDM 99-2 Preliminary digital surficial geologic map of the Douglas 30' x 60' Quadrangle, Converse and Platte Counties, Wyoming

HSDM 99-3 Preliminary digital surficial geologic map of the Powell 30' x 60' Quadrangle, Bighorn and Park Counties, Wyoming, and southern Montana

HSDM 99-4 Preliminary digital surficial geologic map of the Rock Springs 30' x 60' Quadrangle, Sweetwater County, Wyoming

HSDM 99-5 Preliminary digital surficial geologic map of the Sheridan 30' x 60' Quadrangle, Sheridan, Johnson, and Campbell Counties, Wyoming, and southeastern Montana

HSDM 99-6 Preliminary digital surficial geologic map of the Torrington 30' x 60' Quadrangle, Goshen and Platte Counties, Wyoming, and western Nebraska

HSDM 00-2 Preliminary Digital Surficial Geologic Map of the Buffalo 30' x 60' Quadrangle, Johnson and Campbell Counties, Wyoming

HSDM 00-3 Preliminary Digital Surficial Geologic Map of the Cody 30' x 60' Quadrangle, Park County, Wyoming

HSDM 00-4 Preliminary Digital Surficial Geologic Map of the Kaycee 30' x 60' Quadrangle, Johnson and Campbell Counties, Wyoming

HSDM 00-5 Preliminary Digital Surficial Geologic Map of the Newcastle 30' x 60' Quadrangle, Weston and Niobrara Counties, Wyoming , and Western South Dakota

HSDM 00-6 Preliminary Digital Surficial Geologic Map of the Worland 30' x 60' Quadrangle, Big Horn, Washakie, and Johnson Counties, Wyoming

HSDM 01-2 Preliminary Digital Surficial Geologic Map of the Burgess Junction 30' x 60' Quadrangle, Big Horn and Johnson Counties, Wyoming, and Southeastern Montana

HSDM 01-3 Preliminary Digital Surficial Geologic Map of the Devils Tower 30' x 60' Quadrangle, Crook County, Wyoming, Western South Dakota, and Southeastern Montana

HSDM 01-4 Preliminary Digital Surficial Geologic Map of the Lance Creek 30' x 60' Quadrangle, Niobrara and Converse Counties, Wyoming, Southwestern South Dakota, and Northwestern Nebraska

HSDM 01-5 Preliminary Digital Surficial Geologic Map of the Lusk 30' x 60' Quadrangle, Niobrara, Goshen, and Platte Counties, Wyoming , and Northwestern Nebraska Guideline approved by Water and Waste Advisory Board Page 6 October 1, 2002

HSDM 01-6 Preliminary Digital Surficial Geologic Map of the Sundance 30' x 60' Quadrangle, Crook and Weston Counties, Wyoming, and Southwestern South Dakota

PUBLISHED DIGITAL BEDROCK GEOLOGIC MAPS

HSDM 98-2 Digital geologic map of the Cheyenne 30' x 60' Quadrangle, southeastern Wyoming, western Nebraska, and Northern Colorado

HSDM 99-1 Digital geologic map of the Gillette 30' x 60' Quadrangle, Campbell, Crook, and Weston Counties, northeastern Wyoming

HSDM 00-1 Digital Geologic Map of the Laramie 30' x 60' Quadrangle, Albany and Laramie Counties, Wyoming

HSDM 01-1 Digital Geologic Map of the Sheridan 30' x 60' Quadrangle, Sheridan, Johnson and Campbell Counties, Wyoming, and Southeastern Montana

USGS SURFICIAL GEOLOGIC MAPS

The US Geological Survey has published surficial geologic maps for the Recluse 30' x 60' Quadrangle (Reheis and Williams, 1984), the Reno Junction 30' x 60' Quadrangle (Reheis and Coates, 1987), and the Gillette 30' x 60'

Quadrangle (Reheis, 1987). Those maps were slightly modified by the Wyoming State Geological Survey to be consistent with the HSDM surficial map series.

Reheis, M.C., 1987, Surficial geologic map of the Gillette 30' x 60' Quadrangle, Campbell and Crook Counties, Wyoming: U.S. Geological Survey Coal Investigations Map C-105, scale 1:100,000.

Reheis, M.C., and Coates, D.A., 1987, Surficial geologic map of the Reno Junction 30' x 60' Quadrangle, Campbell and Weston Counties, Wyoming: U.S. Geological Survey Coal Investigations Map C-106, scale 1:100,000.

Reheis, M.C., and Williams, V.S., 1984, Surficial geologic map of the Recluse 30' x 60' Quadrangle, Wyoming and Montana: U.S. Geological Survey Coal Investigations Map C-81-F, scale 1:100,000.

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/pjb 2-3328-doc

Additional BLM Guidance

Off-channel CBM water containment structures will be designed to meet the following requirements and minimum standards:

1. As much as practical, the off-channel containment structure shall be located on level ground and away from established drainage patterns, including intermittent/ephemeral drainage ways, and unstable ground or depressions in the area.

2. The off-channel containment structure shall have adequate storage capacity for safe containment of all produced water, even in those periods when evaporation rates are at a minimum. Bottom dimensions must be large enough to accommodate construction equipment. The design shall provide for a minimum of two (2) feet of freeboard.

3. Depth shall be a minimum of 10 feet based on soil classification, surface terrain, evaporation, and storage requirements.

4. The containment structure levees are to be constructed so that the inside grade of the levee is no steeper than 3 (horizontal):1 (vertical), and the outside grade no steeper than 2:1[1].
5. The top of the levees shall be level and at least 12 feet wide[1].

6. The containment structure location shall be reclaimed pursuant to the requirements and standards of the surface management agency (BLM). On a split estate (private surface, Federal mineral) a surface owner's release statement or form is acceptable.

7. Fencing may be required on a case-by-case basis, determined through the pre-approval on-site inspection and NEPA analysis or if there is no beneficial use.

Notes:
[1] Design criteria may be changed by BLM Civil Engineer.

Operators must include as part of the WMP, detailed evidence that any off-channel CBM-produced water containment structure will function in a manner that will facilitate the containment, infiltration, and evaporation of the Federally-produced CBM water and resulting in minimal environmental impact.

Required data will include, but is not limited to: Depth to nearest confining layer; depth to uppermost shallow aquifer and aquifer water quality; average monthly evaporation and precipitation; and evidence that impounded water will not enter 'waters of the state'.

Off-channel containment structures will be sited in accordance with the criteria required by the WDEQ. If the off-channel containment structure is located on fee or state leases it will be regulated by the WOGCC. If the off-channel containment structure is constructed on Federal surface or on private surface/Federal mineral, the BLM is the regulating agency.

A hydrologic watershed analysis, based on field reconnaissance, must be Completed.

Appendix J
Biological Assessment

Final Biological Assessment

POWDER RIVER BASIN OIL AND GAS PROJECT

Prepared for:

U.S. Department of Interior

Fish and Wildlife Service

September 3, 2002

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Biological Assessment for the Powder River Basin Oil and Gas Project

Introduction

The purpose of the Biological Assessment (BA) is to review the BLM's preferred alternative for the Environmental Impact Statement (EIS) for the Powder River Basin (PRB) Oil and Gas Project in sufficient detail to determine if the action "may affect" any federally listed threatened, endangered, or proposed species. This BA was prepared in accordance with the legal requirements set forth under Section 7 (c) of the Endangered Species Act (16 U.S.C.) 1536, stating that a biological assessment be prepared for any Federal action that is a major construction activity to determine the effects of the preferred alternative on listed and proposed species.

Consultation to Date

Informal consultation on this project began with the Service's receipt of the Bureau's May 22, 2000, scoping notice for the development of additional coal bed methane wells on Federal lands in the Powder River Basin, Wyoming (USFWS tracking No. WY3676). On June 5, 2001, the Service provided an updated species list for the Powder River Basin Oil and Gas Project (USFWS tracking No. WY4717). These species are the bald eagle (*Haliaeetus leucocephalus*), black-footed ferret (*Mustela nigripes*), mountain plover (*Charadrius montanus*), and Ute ladies'-tresses orchid (*Spiranthes diluvialis*). No scoping comments were provided for ER-00/0758 (USFWS tracking No. WY5349).

Formal consultation was initiated on January 30, 2002, with the Service's receipt of the Bureau's Biological Assessment and Draft EIS and Draft Planning Amendment for the Powder River Basin Oil and Gas Project. The Service's letter of February 21, 2002, acknowledged receipt of the Biological Assessment and informed the Bureau that the Service had the information required to initiate consultation or the information was otherwise accessible for our consideration and reference. The Service's biological opinion was due on June 13, 2002. Because of the national public interest in this project the Bureau extended the comment period to May 15, 2002. On May 30, 2002, the Service received a letter from the Bureau extending by 30 days the due date for the biological opinion. The Service provided a draft copy of this Biological and Conference Opinion to the Bureau's Buffalo Field Office on June 27, 2002.

In the Bureau's letter of July 8, 2002, they requested the Service not finalize our Biological and Conference Opinion at this time. Bureau and Service personnel met on August 8, 2002 to discuss the terms and conditions in the Draft Biological and Conference Opinion. This revised Biological Assessment incorporates mitigation modifications discussed at and since the August 8 meeting. The Bureau is reinitiating consultation with the delivery of this final biological assessment to the Service.

Description of the Project

A group of oil and gas companies, collectively identified as the PRB Companies (Companies), has notified the U.S. Department of Interior, Bureau of Land Management (BLM) and U.S. Department of Agriculture, Forest Service (FS) of their intent to develop additional coal bed methane (CBM) resources in Wyoming's PRB. Implementation of this project would continue and expand development of CBM that has been occurring in the PRB over the last few years. In general, the Companies propose to 1) drill, complete, operate, and reclaim almost 39,400 new natural gas wells; and 2) construct, operate, and reclaim various ancillary facilities needed to support the new wells, including roads, pipelines for gathering gas and produced water, electrical utilities, and compressors.

The Companies hold valid federal, state, and private leases for oil and natural gas in the Project Area. The leases exist in a hodge-podge pattern of BLM, state, private, and split estate ownership, which results in an interspersed pattern rather than large tracts of single ownership. The leases have created contractual and property rights for the Companies from the United States, the State of Wyoming, and private mineral owners to develop oil and natural gas resources. The purpose of the Companies' proposal is to extract and transport oil and natural gas at a profit from the portions of the Project Area leased by them.

The preferred alternative would occur in an almost 8 million-acre Project Area. The Project Area encompasses all or parts of Campbell, Converse, Johnson, and Sheridan counties and all or parts of eighteen 4th order watersheds (sub-watersheds). The preferred alternative would involve both public and privately owned lands. The public lands include lands administered by the BLM, National Forest System lands, and state lands. Surface ownership is mostly owned by private entities, but the federal government owns the oil and gas rights. Additional information on land ownership and jurisdiction is presented in Chapter 3 of the EIS.

The preferred alternative is to continue development of CBM and conventional oil/gas resources within the Project Area. It is projected that an additional 39,367 CBM wells and 3,200 conventional (i.e., non-CBM) oil/gas wells would be developed over the next ten years. The preferred alternative is a combination of the Companies' proposal and the BLM's Reasonably Foreseeable Development (RFD) Scenario. The BLM used the RFD Scenario's moderate level of development and the Companies' proposal to establish the overall level of development of CBM resources likely for the preferred alternative. The BLM used the RFD Scenario to establish the overall level of additional development of non-CBM resources within the PRB.

If the preferred alternative is implemented, the Companies would drill, complete, and operate 51,391 CBM wells in a ten-year period, including the 12,024 CBM wells already drilled or permitted for drilling in the Project Area. The Companies also would construct the ancillary facilities needed to support these wells. The ancillary facilities include access roads, pipelines for gathering gas and produced water, electrical utilities, facilities for measuring and compressing gas, facilities for treating, discharging, disposing of, containing, or injecting produced water, and pipelines for delivering gas to high-pressure transmission pipelines headed to market.

The overall life of the preferred alternative, including drilling, production, and reclamation, is expected to be about 20 years. Construction of the 39,367 new wells would begin during 2003. The productive life of each well is expected to be about seven years. Accordingly, production from at least some of the 39,367 new wells is expected to last until 2019. Final reclamation of these wells would occur during the two to three years following the end of production for each well. Thus, the preferred alternative would be completed around 2022.

Based on the practice of collocation and knowledge of where multiple gas-productive coal beds exist, the BLM and Companies project the 39,367 new wells would be drilled from about 26,000 well pads. The total number of wells and well pads are based on an 80-acre well spacing pattern overall (i.e., eight pads per square mile). Including the pads constructed for wells drilled before 2002, the 51,391 CBM wells would be distributed across almost 35,600 well pads. The number of wells on a pad would range from one to three.

Under the preferred alternative, the Companies would drill, operate, and maintain wells and construct ancillary facilities in ten of the 18 sub-watersheds that comprise the Project Area. However, most (63 percent) of the new wells and facilities would be constructed in two sub-watersheds: the Upper Powder River and Upper Belle Fourche River sub-watersheds. Other sub-watersheds with relatively high numbers of wells and facilities include Clear Creek, Crazy Woman Creek, Upper Tongue River, and Little Powder River.

Overall, implementation of the CBM portion of the preferred alternative could disturb as many as 202,809 surface acres, most of which would be associated with the construction of pipelines, roads, and water handling facilities. Compressor stations would account for the smallest amount of the overall surface disturbance. Following the reclamation of pipelines and the partial reclamation of other facilities, such as well pads, the preferred alternative's long-term disturbance (i.e., lasting beyond the construction period) from CBM development would encompass about 95,140 acres. The long-term disturbance is 47 percent less than the total short-term disturbance. The roads and water handling facilities would comprise most of the long-term disturbance. Disturbance from conventional development is estimated to effect 8,803 acres short-term and 7,520 acres long-term.

The EIS describes the preferred alternative, as well as the other alternatives considered, in detail. The following sections describe the existing environment, potential effects from the action, the determination, the cumulative effects, and the anticipated mitigation actions for the listed or proposed species considered by the USFWS to possibly be affected within the Project Area.

Bald Eagle

Existing Environment

On February 14, 1978, the bald eagle was listed as endangered in all of the conterminous United States except Minnesota, Wisconsin, Michigan, Oregon, and Washington, where it was classified as endangered (43 F.R. 6233). The USFWS reclassified the bald eagle from endangered to threatened throughout its range in the lower 48 states on July 12, 1995 (60 F.R. 36000). The bald eagle was proposed for delisting on July 6, 1999 (64 F.R. 36454). Currently, the proposal has not been finalized or withdrawn.

Bald eagles usually nest in trees near water, but are known to nest on cliffs and the ground. Nest sites are usually in large trees near (i.e., within one mile of) shorelines in relatively remote areas that are free of disturbance (USFWS 1999). The bald eagle typically lays a clutch ranging from one to three eggs that are incubated by both the male and female birds for approximately 35 days resulting in usually one or two eaglets produced by the pair (Stalmaster 1987). The recommended spatial buffer around nests for threatened and endangered raptors in arid landscapes, including the bald eagle, is 1.0 mile (Roman and Muck 1999).

Feeding areas, diurnal perches, and night roosts are fundamental elements of bald eagle winter range. Wintering bald eagles primarily occur where all three of these elements are in close proximity, although they will fly up to 15 miles where these elements are sparsely distributed across the landscape (Swisher 1964), as in this part of Wyoming. Food availability is probably the single most important factor affecting winter bald eagle distribution and abundance (Steenhof 1976). Fish and waterfowl are the primary sources of food where eagles occur along rivers and lakes. Big game and livestock carrion, as well as larger rodents (e.g., prairie dogs) also can be important dietary components where these resources are available.

Bald eagles nest throughout Wyoming, including the Project Area. Within the Project Area, active nests tend to be associated with forested riparian areas and large lakes and reservoirs that have mature cottonwood trees.

Effects of the Preferred Alternative

Several direct effects to bald eagles including human disturbance, equipment noise, power line collision and electrocution, and vehicular collision may affect bald eagles. Human disturbances during the life of the preferred alternative may vary by type and intensity, ranging from one-time pedestrian surveys of development areas, well pad construction and well development, to regular maintenance trips to wells, as well as various equipment operation by humans. Raptors have been known to become accustomed to some human activities, particularly activities that occur regularly and predictably. However, in some cases, particularly nesting and wintering roosts, raptors may exhibit particular sensitivities to nearby human activities, regardless of the activity and its intensity. Disturbance to nesting raptors can cause nest failure, nest abandonment, and unsuccessful fledgling of young. New and additional levels of human disturbance in an area relatively void of human disturbance may have a negative effect to wintering bald eagles roosting and perching in the Project Area. Due to the relative lack of human activity, bald eagles may exhibit sensitivities to activities of short duration and extent that would not otherwise affect bald eagles of other landscapes that are more accustomed to disturbance.

Noise and activities around facilities may disturb bald eagles in nesting attempts, and perhaps foraging, within a certain distance of compressor stations and other facilities. The extent to which these disturbances would affect the bald eagle is unknown and depends on the frequency of maintenance activities, the amount of noise produced by the different types of facilities, and the ability of bald eagles to become accustomed to both consistent noise, and sporadically occurring maintenance activities.

The presence of new aboveground power lines would increase the potential for power line collisions and electrocutions. Power lines from individual well pads to the facilities within each pod, would be constructed underground. These lines are expected to account for the majority of the new lines constructed during the life of the project.

Increased vehicular traffic may result in increased collisions with bald eagles. Collisions with vehicles are often associated with carrion feeding along high-speed roadways. Because project-related activities are expected to increase commercial and private traffic levels on public highways within the Project Area, the potential for vehicular collision along these existing highways is expected to increase. The maximum design speed of the access roads is 25 mph, vehicle speeds are not expected to exceed this. Within CBM development fields, county roads used to travel to and from the facilities are posted for a 45-mph speed limit. Therefore, vehicle collisions with bald eagles are expected to be uncommon.

Indirect effects to the bald eagle would result from destruction of prey habitat due to well pad and road construction and discharging water, as well as fragmentation of prey habitat and human disturbance to prey populations. Collectively, habitat destruction and disturbance due to project-related activities may result in the loss of suitable nesting and wintering habitats and the loss of preferred prey species habitats and possible reductions in prey base numbers. Quantification of potential losses is directly associated with expected losses by vegetation type. Prey species, particularly small- and medium-sized mammals, may experience losses due to direct mortality and/or loss of habitat. In some instances, particularly with water handling methods, local habitat conditions may improve from the increased water availability and, in turn, benefit local prey species and their dependent predators, including the bald eagle. These benefits may be considered non-permanent, because any improved water availability conditions are expected to return to pre-project levels following the life of the

Project. Local prey species may experience a temporary shift in population levels, while population numbers respond to new environmental conditions.

Water handling methods would most likely affect prey habitats and, subsequently, prey population numbers, but water handling methods would not likely directly affect bald eagles or their habitats. Potential adverse effects of water handling facilities may include localized destruction of prey habitats and possible changes in population numbers of locally occurring prey species (i.e., small- and medium-sized mammals).

Mitigation

- In the event that a bald eagle (dead or injured) is located during construction or operation, the USFWS' Wyoming Field Office (307-772-2374) and the USFWS' Law Enforcement Office (307-261-6365) will be notified within 24 hours.
- Site-specific project areas will be evaluated for suitable bald eagle nesting and roosting habitat prior to permit approval. Suitable nesting habitat is any mature stand of conifer or cottonwood trees in association with rivers, streams, reservoirs, lakes or any significant body of water. Suitable roosting habitat is defined as any mature stands of conifer or cottonwood trees.
- The BLM shall monitor all take of bald eagle habitat associated with the preferred alternative. The actual measurement of disturbed habitat is the responsibility of BLM but can be delegated to BLM' agent (consultant, contractor, etc.) A written summary will be provided to the USFWS' Wyoming Field Office semi-annually. The semi-annual report will include field survey reports for endangered, threatened, proposed and candidate species for all actions covered under the *Environmental Impact Statement (EIS) for the Powder River Basin Oil and Gas Project* and ROD. The semi-annual reports will include all actions completed up to 30 days prior to the reporting dates. The first report will be due 6 months after the signing of the ROD and on the anniversary date of the signing of the ROD. Reporting will continue for the life of the project.
- The BLM shall monitor all road-associated carcasses, jackrabbit sized and larger, along project (operator-maintained) roads.
- All power lines would be built to protect raptors, including wintering bald eagles, from accidental electrocution using methods detailed by the Avian Power Line Interaction Committee (1996).
- Special habitats for raptors, including wintering bald eagles, would be identified and considered during the review of the APD/POD or Sundry Notices.
- Surveys for active bald eagle nests and winter roost sites will be conducted within suitable habitat by a BLM approved biologist. Surface disturbing activities will not be permitted within one mile of suitable habitat prior to survey completion.
- A minimum disturbance-free buffer zone of 0.5 mile (i.e., no surface occupancy) would be established year-round for all bald eagle nest sites. A

seasonal minimum disturbance-free buffer zone of one mile would be established for all bald eagle nest sites (February 15 – August 15).

- A seasonal minimum disturbance-free buffer zone of 1 mile would be established for all bald eagle winter roost sites (November 1 – April 1). These buffer zones and timing may be adjusted based on site-specific information through coordination with, and written approval from, the USFWS.
- Within ½ mile of bald eagle winter roost sites additional measures such as remote monitoring and restricting maintenance visitation to between 9:00 and 3:00 may be necessary to prevent disturbance (November 1 – April 1).
- Maximum design speed on all operator constructed and maintained roads shall not exceed 25 miles per hour to minimize the chance of a collision with a bald eagle, other wildlife, or livestock.
- Additional mitigation measures may be necessary if the site-specific project is determined by a BLM biologist to have adverse effects to bald eagles or their habitat.

Determination

Implementation of the preferred alternative **is likely to adversely affect** the bald eagle and its habitat. The determination is based on the evaluation of the potential adverse effects of the preferred alternative on the bald eagle including implementation of the mitigation measures presented in this BA.

Black-footed Ferret

Existing Environment

The black-footed ferret (*Mustela nigripes*) is a federally-listed endangered species. The black-footed ferret, a nocturnally active mammal, is closely associated with prairie dogs, depending almost entirely upon the prairie dog for its survival. The decline in ferret populations has been attributed to the reduction in the extensive prairie dog colonies that historically existed in the western United States. Ferrets may occur within colonies of white-tailed or black-tailed prairie dogs. The Project Area is within the range of the black-tailed prairie dog. The minimum colony size of black-tailed prairie dogs required to be considered black-footed ferret habitat is 80 acres (USFWS 1989). At least 382 black-tailed prairie dog colonies greater than 80 acres in size have been identified to date within the Project Area. Additional colonies are expected to be found, due to the vast areal extent of short-grass and mixed-grass prairie within the Project Area.

The Project Area is within the historical range of the black-footed ferret, although no black-footed ferrets are presently known to occur in northeastern Wyoming. The last known wild population was discovered in 1981 near the town of Meeteetse. Individuals from this population were captured in 1985 through 1987 and raised in protective captive breeding facilities in an effort to prevent the species' extinction (Clark and Stromberg 1987). Recent survey efforts in a former re-introduction site within the Shirley Basin have identified that a population has been successfully established. This is the only known population in Wyoming (Marinari 2001). Other populations of reintroduced captive-bred individuals exist in western South Dakota, eastern Montana, and Arizona. Extensive efforts have failed to identify any populations of this species within the Project Area; hence occurrence of this species within the Project Area is unlikely.

Effects of the Preferred Alternative

Oil and gas development within the Powder River Basin will likely disturb suitable black-footed ferret habitat. Compliance with the proposed mitigation measures will reduce the likelihood of adverse effects.

Mitigation

- Site-specific project areas will be evaluated for suitable black-footed ferret habitat prior to permit approval. Suitable habitat consists of a black-tailed prairie dog town or complex greater than 80 acres (USFWS 1989). A prairie dog town is a group of intact prairie dog holes whose density exceeds 8 burrows/acre; a complex consists of two or more neighboring prairie dog towns each less than 4.34 miles (7 kilometers) from the other (USFWS 1989).

- Prairie dog colonies will be avoided wherever possible.

- If suitable prairie dog colonies cannot be avoided, surveys will be conducted in compliance with the USFWS guidelines (USFWS 1989). The entire colony or colony complex affected will be surveyed, even if part of the colony has a burrow density below eight per acre.

- If any black-footed ferrets are located, the USFWS will be consulted. Absolutely no disturbance will be allowed within prairie dog colonies inhabited by black-footed ferrets.

- Additional mitigation measure may be necessary if the site-specific project is determined by a BLM biologist to have adverse effects to black-footed ferrets or their habitat.

Determination

Implementation of the preferred alternative **may affect, but is not likely to adversely affect** the black-footed ferret. This determination is based on the mitigation measures presented in this BA and because of the lack of known black-footed ferret colonies in the Project Area.

Mountain Plover

Existing Environment

The mountain plover (*Charadrius montanus*) is proposed for federal listing as a threatened species (USFWS 2001). This species utilizes high, dry, shortgrass prairie with vegetation typically shorter than four inches tall. Within this habitat, areas of blue grama (*Bouteloua gracilis*) and buffalograss (*Buchloe dactyloides*) are most often utilized, as well as areas of mixed-grass associations dominated by needle-and-thread (*Hesperostipa comata*) and blue grama (Dinsmore 1983).

Nests consist of a small scrape on flat ground in open areas. Most nests are placed on slopes of less than five degrees in areas where vegetation is less than three inches tall in April. More than half of identified nests occurred within 12 inches of old cow manure piles and almost 20 percent were found against old manure piles in similar habitats in Colorado. Nests in similar habitats in Montana (Dinsmore 1983) and other areas (Ehrlich et al. 1988) were nearly always associated with the heavily grazed short-grass vegetation of prairie dog colonies.

Mountain plovers arrive on their breeding grounds in late March with egg-laying beginning in late April. Clutches are hatched by late June and chicks fledge by late July. The fall migration begins in late August and most birds are gone from the breeding grounds by late September.

In Wyoming, this species is a common breeding resident (Luce et al. 1999) and does occur within suitable habitats in the Project Area. Data compiled by the BLM office in Buffalo indicate mountain plover nesting has been documented sporadically throughout the Project Area, including northeastern Converse County, near Gillette and Sheridan. The Wyoming Natural Diversity Database recently published the results of their 2001 survey efforts (modified from the USFWS protocol) in the Powder River Basin of Wyoming (Keinath et al. 2001). Surveys were made only from public roads leaving a great deal of potentially suitable habitats unsurveyed. During these surveys, nine sightings of mountain plovers were recorded, of which two where within the Project Area. Suitable habitat was identified in the Project Area, but characterized as limited and fragmented.

Effects of the Preferred Alternative

The preferred alternative has the potential to have substantial adverse direct and indirect effects to the mountain plover. Direct loss of individuals and nests may occur as a result of vehicle collision and equipment operation in nesting areas. Chicks and eggs in nests may also be lost if disturbance or harassment occurs frequently, preventing adults from tending to chicks or nests and allowing excessive heating, chilling, or predation to occur. Frequent disturbance may lead to nest abandonment. Re-nesting may occur at another, less disturbed location, but a net loss in reproductive potential may occur with loss of the initial nest. Mountain plovers also show a high rate of nest site fidelity, often using the same general area year after year. Modifications that make these sites less suitable for nesting would likely result in decreased reproductive success. New nests may be placed in less suitable habitat, resulting in potentially lower reproductive success.

Noise and activities around facilities would likely prevent mountain plovers from nesting, and perhaps foraging, within a certain distance of compressor stations and other facilities. The extent to which these disturbances would affect the mountain plover is unknown and depends on the frequency of maintenance activities, the amount of noise produced by the different types of facilities, and the ability of mountain plovers to become accustomed to consistent noise and sporadically occurring maintenance activities.

Preferred nesting habitats, such as bare soil, may be created by construction and production activities. While providing habitat, these areas are also likely to result in nests being abandoned or destroyed when activities continue during the nesting season. The potential for this type of impact to occur would be greatest during the production phase, when limited, intermittent activity occurs at well pads and along some access roads. Mountain plovers may arrive and begin nesting on bare ground in these areas, only to be disturbed or have nests destroyed the next time the road is used or the well pad is visited. This impact is most likely when activities occur at an interval of one week or more. During the construction phase, continuous activity is likely to prevent nest establishment in proximity to activities.

Disturbance of prairie dog colonies that provide important habitat components for the mountain plover may have negative effects on this species by reducing the amount of heavily grazed short-grass prairie vegetation.

Predator populations that often increase in areas impacted by humans, such as corvids (i.e., crows, ravens), raptors, coyotes, badgers, weasels, and foxes, may experience an increase in some affected portions of the Project Area and would likely adversely affect mountain plovers. New fences, transmission lines, and buildings would provide new perch and nest sites for avian predators, while buildings and other facilities may provide new denning sites for mammalian predators. Increases in vehicular collisions with wildlife along new and existing roads would provide a food source that may allow increases in predator populations that could also prey on mountain plovers.

Mitigation

- In the event that a mountain plover is located during construction or operation, the USFWS' Wyoming Field Office (307-772-2374) and the USFWS' Law Enforcement Office (307-261-6365) will be notified within 24 hours.
- Site-specific project areas will be evaluated for suitable mountain plover nesting habitat prior to permit approval. Flat areas of short-grass prairie or low shrubs with a prevalence of bare ground characterize suitable mountain plover nesting habitat. Typically the vegetation height is less than 4 inches, and bare ground is greater than 30%.

- The BLM shall monitor all take of mountain plover habitat associated with the preferred alternative. The actual measurement of disturbed habitat is the responsibility of BLM but can be delegated to BLM' agent (consultant, contractor, etc.) A written summary will be provided to the USFWS' Wyoming Field Office semi-annually. The semi-annual report will include field survey reports for endangered, threatened, proposed and candidate species for all actions covered under the *Environmental Impact Statement (EIS) for the Powder River Basin Oil and Gas Project* and ROD. The semi-annual reports will include all actions completed up to 30 days prior to the reporting dates. The first report will be due 6 months after the signing of the ROD and on the anniversary date of the signing of the ROD. Reporting will continue for the life of the project.
- No ground-disturbing activities shall occur in suitable nesting habitat prior to surveys for nesting mountain plovers conducted in compliance with the USFWS' Mountain Plover Survey Guidelines (USFWS 2002). A BLM approved biologist will conduct the surveys. Once occupied mountain plover nesting habitat is located, the BLM shall reinitiate section 7 consultation with the USFWS on any project-related activities proposed for such habitat. The amount and nature of ground-disturbing activities shall be limited within identified nesting areas in a manner to avoid the abandonment of these areas.
- Operators and the BLM shall be provided by the USFWS with educational material illustrating and describing the mountain plover, its habitat needs, life history, threats, and gas development activities that may lead to incidental take of eggs, chicks, or adults with requirements that these materials be posted in common areas and circulated in a memorandum among all employees and service providers.
- A disturbance-free buffer zone of 0.25 mile would be established around all mountain plover nesting locations between March 15 and July 31.
- Project-related features that encourage or enhance the hunting efficiency of predators of mountain plover would not be constructed within 0.25 mile of known mountain plover nest sites.
- Construction of ancillary facilities (e.g., compressor stations, processing plants) shall not be located within 0.5 mile of known nesting areas. The threats of vehicle collision to adult plovers and their broods shall be minimized, especially within breeding aggregation areas.
- Where possible, roads will be located outside of plover nesting areas. Maximum allowed travel speed on roads within ½ mile of identified plover nesting areas shall not exceed 25 mph from March 15 and July 31.
- Maximum design speed on all operator constructed and maintained roads shall not exceed 25 miles per hour.
- Work schedules and shift changes should be set to avoid the periods from 30 minutes before to 30 minutes after sunrise and sunset during June and July, when mountain plovers and other wildlife are most active.
- The BLM shall monitor all road-associated carcasses, jackrabbit sized and larger, along project (operator-maintained) roads. The presence of carrion could attract mountain plover predators.

- Creation of hunting perches or nest sites for avian predators within 0.5 mile of identified nesting areas shall be avoided by burying powerlines, using the lowest possible structures for fences and other structures and by incorporating perch-inhibiting devices into their design.
- Capped and abandoned wells shall be identified with markers no taller than four feet with perch inhibiting devices on the top to avoid creation of raptor hunting perches within 0.5 mile of nesting areas.
- Reclamation of areas of previously suitable mountain plover habitat would include the seeding of vegetation to produce suitable habitat for mountain plover.
- To minimize destruction of nests and disturbance to breeding plovers from reclamation activities, no grading, seeding, or other ground-disturbing activities shall occur from April 10 to July 10 unless surveys consistent with the USFWS' Mountain Plover Survey Guidelines (USFWS 2002) find that no plovers are nesting in the area.
- Additional mitigation measures may be necessary if the site-specific project is determined by a BLM biologist to have adverse effects to mountain plovers or their habitat.

Determination

Implementation of the preferred alternative is **likely to adversely affect, but not likely to jeopardize the continued existence of** the mountain plover or its habitat. The determination is based on the evaluation of the potential adverse effects of the preferred alternative on the mountain plover and includes implementation of the mitigation measures presented in this BA.

Ute Ladies'-tresses Orchid

Existing Environment

Ute ladies'-tresses orchid (*Spiranthes diluvialis*), listed as a federally threatened species, is a perennial herb with erect, glandular-pubescent stems 12 to 50 cm tall arising from tuberous-thickened roots (USFWS 1992). This species flowers from late July to September. Plants probably do not flower every year and may remain dormant below ground during drought years. In Wyoming, Ute ladies'-tresses orchid is known from the western Great Plains in Converse, Goshen, Laramie, and Niobrara counties. Rangewide, Ute ladies'-tresses orchid occurs primarily on moist, sub-irrigated or seasonally flooded soils in valley bottoms, gravel bars, old oxbows, or floodplains bordering springs, lakes, rivers, or perennial streams between 1780 and 6800 feet elevation (Fertig and Beauvais 1999). Suitable soils vary from sandy or coarse cobbley alluvium to calcareous, histic, or fine-textured clays and loams. Populations have been documented from alkaline sedge meadows, riverine floodplains, flooded alkaline meadows adjacent to ponderosa pine-Douglas-fir woodlands, sagebrush steppe, and streamside floodplains. Some occurrences are also found on agricultural lands managed for winter or early season grazing or hay production. Known sites often have low vegetative cover and may be subjected to periodic disturbances (e.g., flooding or grazing). Populations are often dynamic and shift within a watershed as disturbances create new habitat or succession eliminates old habitat (Fertig and Beauvais 1999). The orchid is well adapted to disturbances from stream movement and is tolerant of other disturbances, such as grazing, that are common to grassland riparian habitats (USFWS 1995). It is known to be established in heavily disturbed sites, such as revegetated gravel pits, heavily grazed riparian edges and along well-traveled foot trails on old berms (USFWS 1995). Ute ladies'-tresses orchid is commonly associated with horsetail, milkweed, verbena, blue-eyed grass, reedgrass, goldenrod, and arrowgrass.

This species is known from four populations in Wyoming, all discovered between 1993 and 1997 (Fertig and Beauvais 1999). One of these populations is recorded from northwestern Converse County and is within the Project Area. There is the potential for this species to occur in suitable habitats within the Project Area.

Effects of the Preferred Alternative

The potential for direct effects to the Ute ladies'-tresses orchid is expected to be minimal. There are no existing oil and gas wells in the upper portion of the Antelope Creek sub-watershed near the known population of this species. None of the wells that are part of the preferred alternative would be constructed near that location. There is the potential that other populations of this species may occur in the Project Area. Because of the ability of this species to persist below ground or above ground without flowering, single season surveys that meet the current USFWS survey guidelines may not detect populations. As a result, part or all of undetected populations could be lost to surface disturbing activities.

Adverse effects to currently undocumented populations of this species could occur as a result of hydrological alterations associated with the preferred alternative. The discharge of produced water is expected to substantially alter the distribution and extent of riparian and wetland areas, with the net effect being an increase in the extent of these areas. This action may provide additional suitable habitat for the Ute ladies'-tresses orchid in areas that are not currently suitable, while at the same time rendering unsuitable some habitat that is currently suitable. Effects along any particular drainage would depend on the amount, quality, timing, and location of water discharge, stream geomorphology, precipitation, and other factors. Salt tolerance can be expected, to some degree, due to the alkaline soils associated with some habitat types of the species. Habitats and populations of this species may be affected by increased erosion or sediment deposition. Some streams would be greatly affected by discharge, while others would be affected only minimally or not at all. The exact nature of water discharge-related impacts would need to be addressed during Application for Permit to Drill (APD) review, when water discharge points have been chosen, and Ute ladies'-tresses surveys completed. It is possible that occurrences of this species downstream of discharge points would not be identified by surveys, particularly if no facilities are planned in the vicinity. These occurrences could be affected by changes in local hydrology resulting from upstream discharge of produced water. The extent of these impacts cannot be quantified at present, due to the lack of surveys for this species, the lack of precise discharge point locations and the lack of knowledge of the interactions between upstream discharges, existing flows, and local conditions in potential habitats for the Ute ladies'-tresses orchid.

Both direct and indirect disturbances to populations and habitats of the Ute ladies'-tresses orchid have the potential to increase the distribution and extent of noxious weeds, such as Canada thistle, that occur in similar habitats. Dense populations of noxious weeds reduce the amount of habitat available to the orchid and could result in the exclusion of the orchid.

Mitigation

- At the discretion of the surface owner, native species would be planted to re-establish special habitats.
- Site-specific project areas will be evaluated for suitable Ute ladies'-tresses orchid habitat prior to permit approval. Suitable habitat is characterized by moist soils near springs, lakes, or perennial streams; most occurrences are in alluvial substrates along riparian edges, gravel bars, old oxbows, and moist to wet meadows in the floodplains of perennial streams (USFWS 1995).
- Suitable habitat will be avoided wherever possible.
- If suitable habitat for Ute ladies'-tresses cannot be avoided, surveys will be conducted in compliance with USFWS standards (USFWS 1995) by a BLM approved biologist or botanist. Be aware, surveys can only be conducted between July 20 and August 31.
- Moist soils near wetlands, streams, lakes, or springs in the project area will be promptly revegetated if construction activities impact the vegetation in these areas. Revegetation will be designed to avoid the establishment of noxious weeds.
- Companies operating in areas identified with weed infestations or suitable Ute ladies'- tresses orchid habitat will be required to submit an integrated pest management plan prior to APD approval. The components of the integrated pest management plans are outlined in the CBM APD and POD Preparation Guide. Mitigation will be determined on a site-specific basis and may include such measures as spraying herbicides prior to entering areas and washing vehicles before leaving infested areas. Infestation areas of noxious weeds have been identified through the county Weed and Pest Districts and are available at the Buffalo BLM office.
- Additional mitigation measures may be necessary if the site-specific project is determined by a BLM biologist to have adverse effects to Ute ladies'-tresses orchids or their habitat.

Determination

Implementation of the preferred alternative **is likely to adversely affect** the Ute ladies'-tresses orchid or its habitat. The determination is based on the evaluation of the potential adverse effects of the preferred alternative on the Ute ladies'-tresses orchid and includes implementation of the mitigation measures presented in this BA.

Cumulative Effects

Implementation of the preferred alternative would contribute to cumulative adverse effects to the threatened, endangered, and proposed species in the Project Area. Cumulative short- and long-term disturbances to these species are many and stem from several sources. Included in the evaluated cumulative effects are the direct effects of oil and gas (CBM and non-CBM) extraction related to the preferred alternative, as well as development of new oil and gas wells on adjacent lands. Oil and gas development would occur on a mix of federal, state, private, and on split estate lands. Additional oil and gas extraction (CBM and non-CBM) may occur at a later date within the Project Area beyond the level of development currently considered. Activities other than oil and gas extraction contributing to cumulative effects in the Project Area include: coal mining; uranium mining; sand, gravel, and scoria mining; ranching; agriculture; road and railroad construction; and rural and urban housing development.

On-going coal mining activities within the PRB disturb surface lands at a rate of approximately 2,000 acres per year, with 1,850 acres reclaimed on an annual basis. At present, coal mining has disturbed approximately 54,000 acres, while 20,200 acres have been reclaimed to State of Wyoming standards. An unknown portion of disturbed coal mining area is currently undergoing reclamation, but has not yet met the Wyoming standards. A similar level of both new disturbance and reclamation is expected in the near future. Reclamation has not been able to successfully re-establish prairie dog colonies; also, Wyoming reclamation standards preclude re-establishment of mountain plover habitat.

Uranium mining within the PRB has resulted in the disturbance of approximately 4,400 acres, while sand, gravel, and scoria mining has resulted in the disturbance of approximately 1,200 acres. Agriculture has resulted in impacts to approximately 113,643 acres of lands formally occupied by native vegetation that that served as suitable habitat for wildlife.

Urban development within the PRB has resulted in the loss of approximately 4,362 acres of native vegetation as suitable wildlife habitat. A minor amount of new rural and urban development is expected in the foreseeable future, but no estimate of the amount or types of vegetation disturbance has yet been made. Cumulative impacts to vegetation from roads, railroads, and rural development are anticipated but have not been estimated.

The total acreage directly affected by CBM development related to the Preferred alternative would not be disturbed simultaneously, because Project development would be distributed over the life of the Project. Some of the disturbed acreage would be reclaimed or would be in the process of being reclaimed when new disturbances are initiated. CBM development is expected to occur at a rate faster than abandonment and reclamation of wells. In the near future, the amount of disturbed habitats would increase, although the anticipated life of CBM wells (12-20 years) indicates that reclamation would eventually overtake new well development, resulting in a net decrease in disturbed vegetation for the long-term.

Cumulative effects would also occur to vegetation resources as a result of indirect impacts. One indirect impact to native vegetation is the potential import and spread of noxious weeds around Project facilities and along roadways. Noxious weeds have the ability to displace native vegetation and hinder reclamation efforts, thus reducing the habitat quality and lengthening the duration of the adverse effect. If weed mitigation and preventative procedures were applied to all construction and reclamation practices, the impact of noxious weeds would be minimized. In areas reclaimed after CBM development elsewhere, the reclaimed areas often differ substantially from undisturbed areas in terms of vegetation cover. Reclaimed areas may not serve ecosystem functions presently served by undisturbed vegetation communities and habitats, particularly in the short-term, when species composition, shrub cover, and other environmental factors are likely to be different. Establishment of noxious weeds and alternation of vegetation along drainages and reclaimed areas has the potential to alter wildlife habitat composition and distribution. As a result, shifts in habitat composition or distribution may affect the four species discussed in this BA.

Unavoidable adverse effects to the four threatened, endangered, and proposed species from the preferred alternative would be some direct loss of habitat, indirect loss of habitat due to human and equipment disturbance, habitat fragmentation, displacement of bald eagle prey species and the resultant change in bald eagle foraging, and mortality caused by equipment activities, motor vehicle collisions, power line collisions, and power line electrocution. As a result, individuals may be reduced in number but not enough to significantly impact the populations.

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Appendix K
Biological Opinion

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
4000 Airport Parkway
Cheyenne, Wyoming 82001

ES-61411
br/W.02/WY6633(ES-6-WY-02-F006)

December 21, 2002

Memorandum

To: Field Manager, Bureau of Land Management, Buffalo Field Office, Buffalo, Wyoming

From: Field Supervisor, U.S. Fish and Wildlife Service, Wyoming Field Office, Cheyenne, Wyoming

Subject: Final Biological and Conference Opinion for the Powder River Basin Oil and Gas Project, Campbell, Converse, Johnson, and Sheridan Counties, Wyoming (Formal Consultation No. ES-6-WY-02-F006)

This document transmits the U. S. Fish and Wildlife Service's (Service) Biological and Conference Opinion based on our review of the proposed Powder River Basin Oil and Gas Project located in Campbell, Converse, Johnson, and Sheridan Counties, Wyoming, and its effects on the bald eagle (*Haliaeetus leucocephalus*), mountain plover (*Charadrius montanus*), and Ute ladies'-tresses orchid (*Spiranthes diluvialis*) in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). Your December 9, 2002, request for formal consultation was received in the Wyoming Field Office on December 10, 2002.

This Biological and Conference Opinion is based on information provided in the December 2001 Biological Assessment (BA); the January 2002, *Draft Environmental Impact Statement and Draft Planning Amendment for the Powder River Basin Oil and Gas Project* (DEIS); the September 3, 2002, Final Biological Assessment (FBA); and numerous telephone conversations and meetings with personnel for the Bureau of Land Management's (Bureau) Buffalo, Mile City, and Billings Field Offices, the Service's Montana and Wyoming State Offices regarding coal bed methane development in Montana and Wyoming. A *Preliminary Final Environmental Impact Statement and Draft Planning Amendment for the Powder River Basin Oil and Gas Project* (PFEIS) was provided to the Service on November 12, 2002. However, the *Final Environmental Impact Statement and Final Planning Amendment for the Powder River Basin Oil and Gas Project* (FEIS) was not available for use in developing this Biological and Conference Opinion because it is still undergoing final revision. Nevertheless, the FBA of September 3, 2002, contains a current and complete description of the project as it will appear in the FEIS, as well as information necessary to complete this consultation.

This Biological and Conference Opinion addresses the effects of 39,367 coal bed methane

(CBM) wells, 3,200 conventional (i.e., non-CBM) oil and/or natural gas wells and associated facilities, including access roads, gas gathering and water disposal pipelines, electrical utilities, and production facilities (such as compressor stations, central delivery points, buildings and meters), pipelines to transport gas to high-pressure transmission lines, and facilities for treating, discharging, disposing of, containing, or injecting produced water, that will be developed on Federal surface lands and/or Federal minerals ownership. A complete administrative record of this consultation is on file at the Service's Wyoming Field Office, Cheyenne, Wyoming.

Consultation History

Informal consultation on this project began with the Service's receipt of the Bureau's May 22, 2000, scoping notice for the development of additional CBM wells on Federal lands in the Powder River Basin, Wyoming. On June 5, 2001, the Service provided an updated species list for the Powder River Basin Oil and Gas Project. Formal consultation was initiated on January 30, 2002, with the Service's receipt of the Bureau's December, 2001, BA and DEIS. The Service acknowledged receipt of the BA on February 21, 2002, and informed the Bureau that the Service had the information required to initiate consultation or the information was otherwise accessible for our consideration and reference. The Service's Biological and Conference Opinion was due on June 13, 2002. Because of the national public interest in this project the Bureau extended the comment period on the DEIS to May 15, 2002. On May 30, 2002, the Service received a letter from the Bureau extending by 30 days the due date for the Biological and Conference Opinion. The Service provided a draft of this Biological and Conference Opinion to the Bureau's Buffalo Field Office on June 27, 2002. In the Bureau's letter of July 8, 2002, they requested the Service not finalize the Biological and Conference Opinion at that time, and that the Bureau would reinitiate consultation in the near future when the FBA, and preferred alternative were finalized. Bureau and Service personnel from Wyoming and Montana met on July 25-26, 2002, in Billings, Montana and on August 8, 2002, in Buffalo, Wyoming. These meetings were to ensure a consistent approach to the identification of project effects and ways to minimize effects on endangered and threatened species identified in both this Biological and Conference Opinion and the Biological and Conference Opinion for the Coal Bed Methane Production in 16 Montana Counties. On August 26, 2002, the Bureau's Buffalo Field Office provided the Service with a draft FBA with changes to the Bureau's proposed mitigation measures. Coordination between the Service and the Bureau in late August and early September of 2002, resulted in agreement on the language of the final mitigation measures and Terms and Conditions to appear in the draft FBA. On September 3, 2002, the Bureau's Buffalo Field Office provided the Service with a FBA and requested reinitiation of formal section 7 consultation for the Powder River Basin Oil and Gas Project. The Bureau requested the Service prepare a Biological and Conference Opinion within 13 days. Additional coordination between the Service and the Bureau's State Office and Buffalo Field Office in early September 2002, provided agreement on how to address conflicting conservation measures designed to protect bald eagle roost sites. On September 16, 2002, the Service provided the Bureau with the requested draft Biological and Conference Opinion. Since September 16, 2002, the Service has not received any comments from the Bureau on this draft Biological and Conference Opinion.

Field Manager, Buffalo Field Office, Bureau of Land Management

On November 12, 2002, the Bureau's Buffalo Field Office provided the Service with a PFEIS for our review and comment. On November 26, 2002, the Service provided comments on the PFEIS. On December 9, 2002, the Bureau, after deciding that Alternative 2A would be the preferred alternative in the FEIS, requested that the Service finalize the Biological and Conference Opinion and provide it to the Bureau by December 17, 2002.

Field Manager, Buffalo Field Office, Bureau of Land Management

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BIOLOGICAL AND CONFERENCE OPINIONS

DESCRIPTION OF PROPOSED ACTION

The Powder River Basin Oil and Gas Project is located in all or parts of Campbell, Converse, Johnson, and Sheridan counties, Wyoming, in the Powder River Basin. The proposed project includes the development of 39,367 CBM wells and 3,200 conventional (i.e., non-CBM) oil and/or natural gas wells on 26,000 well pads within a project area of almost 8,000,000 acres. The project also includes construction of associated facilities, including access roads, gas gathering and water disposal pipelines, electrical utilities, and production facilities (such as compressor stations, central delivery points, buildings and meters), facilities for treating, discharging, disposing of, containing, or injecting produced water, and pipelines to transport gas to high-pressure transmission lines.

The FBA and preferred alternative (2A) identifies an 80-acre well spacing pattern (8 wells or well pads per square mile). Each well pad would have one to three wells (one well per coal seam). Therefore, 8 well pads per section could result in 24 wells (well bores) drilled in each section. The potential short-term disturbance associated with CBM development during drilling and installation of facilities (up to 10 years) is estimated to be approximately 202,843 acres. Following reclamation of pipeline rights-of-way and partial reclamation of other facilities, the long-term disturbance (roads, well pads, etc.) associated with CBM development would be approximately 95,138 acres. Additional short-term and long-term disturbance associated with non-CBM wells and associated facilities is estimated to be approximately 8,803 acres and 7,520 acres, respectively.

Shallow well drilling rigs (truck mounted water well type drilling rigs) will be used for both drilling and completion activities. Each well will be drilled within an estimated 1 to 3 days. Well completion will occur within an additional 1 to 3 days. Well pads will not be leveled unless steep terrain can not be avoided. For producing wells, maintenance personnel may visit wells as often as once each day to ensure equipment is functioning properly. Two-track unimproved roads will be used for access to wells as topography and drainage allow. However, additional access will require the construction of 7,135 miles of improved roads.

Produced water will be piped away from the well sites and disposed of using a variety of methods depending on water quality, water volumes, and landowner desires. Proposed methods for the discharge will include: direct surface discharge into drainages; treatment of produced water followed by direct surface discharge; containment of produced water; and injection of produced water through disposal wells. An estimated maximum production rate of approximately 386,000 acre-feet per year of produced water will occur. The exact amount and location of each discharge will be determined during the application for a permit to drill process.

This biological and conference opinion is based on the effects presented in the FBA associated with a 80-acre well spacing with up to 3 wells (well bores) per pad (up to 24 wells drilled in each section). This Project should be re-analyzed and consultation re-initiated should a denser spacing of wells be planned or occur or, if additional wells per seam are required, and if new information reveals effects of the action in a manner or to an extent not considered initially.

Conservation Measures

The Bureau has attempted to minimize some of the direct and indirect impacts of the project to listed and proposed species, as well as the habitats for these species by incorporating the following conservation measures into the proposed project. These measures (taken verbatim from the September 3, 2002, FBA and identified as "mitigation") are as follows:

Bald Eagle

CM1. In the event that a bald eagle (dead or injured) is located during construction or operation, the Service's Wyoming Field Office (307- 772-2374) and the Service's Law Enforcement Office (307-261-6365) will be notified within 24 hours.

CM2. Site-specific project areas will be evaluated for suitable bald eagle nesting and roosting habitat prior to permit approval. Suitable nesting habitat is any mature stand of conifer or cottonwood trees in association with rivers, streams, reservoirs, lakes or any significant body of water. Suitable roosting habitat is defined as any mature stand of conifer or cottonwood trees.

CM3. The Bureau shall monitor all take (*incidental*of bald eagle habitat associated with the preferred alternative. The actual measurement of disturbed habitat is the responsibility of the Bureau but can be delegated to the Bureau's agent (consultant, contractor, etc). A written summary will be provided to the Service's Wyoming Field Office semi-annually. The semi-annual report will include field survey reports for endangered, threatened, proposed and candidate species for all actions covered under the FEIS for the Powder River Basin Oil and Gas Project and the Record Of Decision (ROD). The semi-annual reports will include all actions completed 30 days prior to the reporting dates. The first report will be due six months after the signing of the ROD and on the anniversary dates of the signing of the ROD. Reporting will continue for the life of the project.

CM4. The Bureau shall monitor all road-associated carcasses, jackrabbit sized and larger, along project (operator-maintained) roads.

CM5. All power lines would be built to protect raptors, including wintering bald eagles, from accidental electrocution using methods detailed by the Avian Power Line Interaction Committee (1996).

CM6. Special habitats for raptors, including wintering bald eagles, would be identified and considered during the review of the Application for Permit to Drill/Plan of Development (APD/POD) or Sundry Notices.

CM7. Surveys for active bald eagle nests and winter roost sites will be conducted within suitable habitat by a Bureau-approved biologist. Surface disturbing activities will not be permitted within 1-mile of suitable habitat prior to survey completion.

CM8. A minimum disturbance-free buffer zone of 0.5 mile (i.e., no surface occupancy) would be established year round for all bald eagle nests. A seasonal minimum disturbance-free buffer zone of 1-mile would be established for all bald eagle nest sites (February 1 - August 15).

CM9. A seasonal minimum disturbance-free buffer zone of 1-mile would be established for all bald eagle winter roost sites (November 1 - April 1). These buffer zones and timing restrictions may be adjusted based on site-specific information through coordination with, and after written approval from the Service.

CM10. Within 0.5 mile of bald eagle winter roost sites additional measures such as remote monitoring and restricting maintenance visitation to between 9:00 AM and 3:00 PM may be necessary to prevent disturbance (November 1 - April 1).

CM11. Maximum design speed on all operator constructed and maintained roads shall not exceed 25 miles per hour to minimize the chance of a collision with a bald eagle, other wildlife, or livestock.

CM12. Additional mitigation measures may be necessary if the site-specific project is determined by a Bureau biologist to have an adverse affect to bald eagles or their habitat.

Black-footed ferret

CM13. Site-specific project areas will be evaluated for suitable black-footed ferret habitat prior to permit approval. Suitable habitat consists of a black-tailed prairie dog town or complex greater than 80 acres (USFWS 1989). A prairie dog town is a group of intact prairie dog holes whose density exceeds 8 burrows/acre; a complex consists of 2 or more neighboring prairie dog towns each less than 4.34 miles (7 kilometers) from the other (USFWS 1989).

CM14. Prairie dog colonies will be avoided wherever possible.

CM15. If suitable prairie dog colonies cannot be avoided, surveys will be conducted in compliance with the Service's guidelines (USFWS 1989). The entire colony or complex affected will be surveyed, even if part of the colony has a burrow density below eight burrows per acre.

CM16. If any black-footed ferrets are located, the Service will be consulted. Absolutely no disturbance will be allowed within prairie dog colonies inhabited by black-footed ferrets.

CM17. Additional mitigation measures may be necessary if the site-specific project is determined by a Bureau biologist to have an adverse affect to black-footed ferrets or their habitat.

Ute ladies'-tresses

CM18. At the discretion of the surface owner, native species would be planted to re-establish special habitats.

CM19. Site-specific project areas will be evaluated for suitable Ute ladies'-tresses orchid habitat prior to permit approval. Suitable habitat is characterized by moist soils near springs, lakes, or perennial streams; most occurrences are in alluvial substrates along riparian edges, gravel bars, old oxbows, and moist to wet meadows in the floodplains of perennial streams (USFWS 1995).

CM20. Suitable habitat will be avoided wherever possible.

CM21. If suitable habitat for Ute ladies'-tresses cannot be avoided, surveys will be conducted in compliance with the Service's guidelines (USFWS 1995) by a Bureau-approved biologist or botanist. Be aware, surveys can only be conducted between July 20 and August 31.

CM22. Moist soils near wetlands, streams lakes or springs in the project area will be promptly revegetated if construction activities impact the vegetation in these areas. Revegetation will be designed to avoid the establishment of noxious weeds.

CM23. Companies operating in areas identified with weed infestations or suitable Ute ladies'-tresses orchid habitat will be required to submit an integrated pest management plan prior to APD approval. The components of the integrated pest management plans are outlined in the CBM APD and POD Preparation Guide. Mitigation will be determined on a site-specific basis and may include such measures as spraying herbicides prior to entering areas and washing vehicles before leaving infested areas. Infestation areas of noxious weeds have been identified through the County Weed and Pest Districts and are available at the Bureau's Buffalo Field Office.

CM24. Additional mitigation measures may be necessary if the site-specific project is determined by a Bureau biologist to have an adverse affect to Ute ladies'-tresses orchids or their habitat.

Mountain Plover

CM25. In the event that a mountain plover (dead or injured) is located during construction or operation, the Service's Wyoming Field Office (307- 772-2374) and the Service's Law Enforcement Office (307-261-6365) will be notified within 24 hours.

CM26. Site-specific project areas will be evaluated for suitable mountain plover nesting habitat prior to permit approval. Flat areas of short-grass prairie or low shrubs with a prevalence of bare ground characterize suitable mountain plover nesting habitat. Typically the vegetation height is less than 4 inches, and bare ground is greater than 30 percent.

CM27. The Bureau shall monitor all take of mountain plover habitat associated with the preferred alternative. The actual measurement of disturbed habitat is the responsibility of the Bureau but can be delegated to the Bureau's agent (consultant, contractor, etc). A written summary will be provided to the Service's Wyoming Field Office semi-annually. The semi-annual report will include field survey reports for endangered, threatened, proposed and candidate species for all actions covered under the FEIS for the Powder River Basin Oil and Gas Project and the ROD. The semi-annual reports will include all actions completed 30 days prior to the reporting dates. The first report will be due 6 months after the signing of the ROD and on the anniversary dates of the signing of the ROD. Reporting will continue for the life of the project.

CM28. No ground-disturbing activities shall occur in suitable nesting habitat prior to surveys for nesting mountain plovers conducted in compliance with the Service's Mountain Plover Survey Guidelines (USFWS 2002). A Bureau-approved biologist will conduct the surveys. Once occupied mountain plover nesting habitat is located, the Bureau shall initiate section 7 consultation with the Service on any project-related activities proposed for such habitat. The amount and nature of ground-disturbing activity shall be limited within identified nesting areas in a manner to avoid the abandonment of these areas.

CM29. Operators and the Bureau shall be provided by the Service with educational material illustrating and describing the mountain plover, its habitat needs, life history, threats, and gas development activities that may lead to incidental take of eggs, chicks, or adults with requirements that these materials be posted in common areas and circulated in a memorandum among all employees and service providers.

CM30. A disturbance-free buffer zone of 0.25 mile would be established around all mountain plover nesting locations between March 15 and July 31.

CM31. Project-related features that encourage or enhance the hunting efficiency of predators of mountain plovers would not be constructed within 0.25 mile of known mountain plover nest sites.

CM32. Construction of ancillary facilities (e.g., compressor stations, processing plants) shall not be located within 0.5 mile of known nesting areas. The threats of vehicle collision to adult mountain plovers shall be minimized, especially within breeding aggregation areas.

CM33. Where possible, roads will be located outside of mountain plover nesting areas. Maximum allowed travel speed on roads within 0.5 mile of identified mountain plover nesting areas shall not exceed 25 miles per hour from March 15 to July 31.

CM34. Maximum design speed on all operator constructed and maintained roads shall not exceed 25 miles per hour.

CM35. Work schedules and shift changes should be set to avoid the periods from 30 minutes before to 30 minutes after sunrise and sunset during June and July, when mountain plovers and other wildlife are most active.

CM36. The Bureau shall monitor all road-associated carcasses, jackrabbit sized and larger, along project (operator-maintained) roads. The presence of carrion could attract mountain plover predators.

CM37. Creation of hunting perches or nest sites for avian predators within 0.5 mile of identified nesting areas shall be avoided by burying power lines, using the lowest possible structures for fences and other structures, and by incorporating perch-inhibiting devices into their design.

CM38. Capped and abandoned wells shall be identified with markers no taller than 4 feet with perch inhibiting devices on top to avoid creation of raptor hunting perches within 0.5 mile of nesting areas.

CM39. Reclamation of areas of previously suitable mountain plover habitat would include the seeding of vegetation to produce suitable habitat for mountain plovers.

Field Manager, Buffalo Field Office, Bureau of Land Management

CM40. To minimize destruction of nests and disturbance to breeding mountain plovers from reclamation activities, no grading, seeding, or other ground-disturbing activities shall occur from April 10 to July 10 unless surveys consistent with the Service's Mountain Plover Survey Guidelines (USFWS 2002) find that no mountain plovers are nesting in the area.

CM41. Additional mitigation measures may be necessary if the site-specific project is determined by a Bureau biologist to have an adverse affect to mountain plovers or their habitat.

STATUS OF SPECIES

Bald eagle

On February 14, 1978, the bald eagle was listed as endangered in all of the conterminous United States except Minnesota, Wisconsin, Michigan, Oregon, and Washington, where it was classified as threatened (43 F.R. 6233). The Service reclassified the bald eagle from endangered to threatened throughout its range in the lower 48 states on July, 12, 1995 (60 F.R. 36000). The bald eagle was proposed for delisting on July 6, 1999 (64 F.R. 36454). Currently, the proposal has not been finalized or withdrawn.

Description

The bald eagle is a large, long-lived bird of prey. Adults have dark-brown bodies, white heads and white tails. This adult plumage is not usually acquired until age four. Juveniles go through a series of plumages prior to achieving the adult coloration and in some plumages the young bear a superficial resemblance to golden eagles (*Aquila chrysaetos*).

Life History/Habitat Use

The eagle may live up to 45 years, achieve sexual maturity at 4 to 5 years, and produce one to three young per year. Publications by the U.S. Army Corps of Engineers (1979), Lincer et al. (1979), U.S. Bureau of Land Management (1973) and Brown and Amadon (1968), provide references on the biology of the species.

Bald eagles usually nest in trees near water, but are known to nest on cliffs and the ground. Nest sites are usually in large trees along shorelines in relatively remote areas that are free of disturbance (USFWS 1999a). The bald eagle typically lays a clutch ranging from one to three eggs which are incubated by both the male and female birds for approximately 35 days resulting in usually one or two eaglets produced by the pair (Stalmaster 1987). The recommended spatial buffer around nests for threatened and endangered raptors, including the bald eagle, is 1-mile (Romin and Muck 1999). The *Greater Yellowstone Bald Eagle Management Plan 1995 update* (Greater Yellowstone Bald Eagle Working Group (GYBEWG) 1996) and the *Montana Bald Eagle Management Plan* (Montana Bald Eagle Working Group (MBEWG) 1994), identify three concentric nest management zones, that surround most recently active and alternate nest sites, and vary by degree of allowable disturbance. Zone I includes the primary nest site area in which human activity or development may stimulate abandonment of the breeding area, affect successful completion of the nesting cycle or reduce productivity (GYBEWG 1996, MBEWG 1994). It includes the area within a 0.25-mile radius of all nest sites in the breeding area that have been active within 5 years or are presently active. Zone II is the Primary Use Area that includes the area 0.25-mile to 0.5-mile from all nest sites that have been active within 5 years. Zone III represents most of the home range used by eagles during the nesting season and usually includes all suitable foraging habitat within 2.5 miles of all nest sites in the breeding area that have been active within five years (GYBEWG 1996, MBEWG 1994).

For the purposes of this biological opinion, bald eagle habitat is defined as all suitable foraging habitat within 2.5 miles of all recently active and currently active bald eagle nests. Furthermore, the Service defines a recently active bald eagle nest as a nest which has been active within the past 5 years. Bald eagle nesting habitat is defined as any mature stand of conifer or cottonwood trees in association with rivers, streams, reservoirs, lakes or any significant body of water. Bald eagle roosting habitat is defined as any mature stands of conifer and cottonwood trees.

Research shows that bald eagles are sensitive to a variety of human activities. Responses to human disturbance vary and may include short term, temporal, or spatial avoidance of the disturbance, to total reproductive failure and abandonment of breeding areas (GYBEWG 1996, MBEWG 1994, Anthony et al. 1995, Stalmaster and Newman 1978). Responses of bald eagles to human disturbance vary depending on the eagle individual/pair, and the type, intensity, duration, time of year, predictability, and location of human activity (Knight and Cole 1995). Survival of individual eagles, particularly those in their first year of life, probably depends heavily on conditions they encounter during the wintering period. The physiological condition of adults at the beginning of each breeding season, an important factor influencing reproductive success, also is affected by how well their energy demands are met in wintering areas. Thus, the survival and recovery of nesting populations depends on the eagles having suitable locations to use throughout the wintering period each year (USFWS 1983). Bald eagles are extremely sensitive to disturbance during nest building, egg laying, and incubation periods (February 1 through May 30). Bald eagles are most likely to desert nest sites during this period if disturbed (GYBEWG 1996, MBEWG 1994), especially if the activity occurs within Nest Management Zones I and II.

During migration and at wintering sites, eagles that concentrate on locally abundant food tend to roost communally. Communal roosts usually are located in stands of mature old growth conifers or cottonwoods, and roosts may be several miles from feeding sites. Wintering bald eagles occur throughout the Nation but are most numerous in the West and Midwest (USFWS 1983). An abundant, readily available food supply in conjunction with one or more suitable night roost sites is the primary feature of winter habitat. Also, eagles prefer to forage in areas with the least human disturbance (USFWS 1978, McGarigal et al. 1991).

The majority of wintering eagles are found near open water where they feed on fish and waterfowl, usually taking those which are dead, crippled, or otherwise vulnerable (USFWS 1983, Lingle and Krapu 1986, Stalmaster and Associates 1990). In addition, eagles are known to feed on carrion, small mammals, and game birds (Lish 1975, U.S. Bureau of Reclamation 1981, Lingle and Krapu 1986). Lingle and Krapu (1986) found eagles consumed at least 50 species of fish, birds, and mammals along the North Platte and Platte Rivers during the winters of 1978-1979 and 1979-1980.

Large, live trees in sheltered areas provide a more favorable thermal environment and help minimize the energy stress encountered by wintering eagles. Communal roosting also may facilitate food-finding (Steenhof 1976) and pair bonding. The proximity of adequate night roosts to the other habitats required by wintering eagles, such as hunting perches and feeding sites, is important (Steenhof et al. 1980). In some locations, the absence of a suitable night roost may limit the use of otherwise suitable habitat. Freedom from human disturbance also is important in communal roost site selection (Steenhof et al. 1980, U.S. Bureau of Reclamation 1981, USFWS 1986, Buehler et al. 1991). Continued human disturbance of a night roost may cause eagles to abandon an area (Hansen et al. 1981, Keister 1981). Typically, buffers around roost sites are one-half the size of buffers around nest sites, so a seasonal buffer zone for wintering bald eagles would be 0.5-mile (Romin and Muck 1999). However, personnel observations suggests that for winter roosts sites in eastern Wyoming, bald eagles appear to be less tolerant of disturbance and a 0.5-mile buffer for winter roost sites may be inadequate (Fitzgerald 2002). For the purposes of this biological opinion an occupied roost site or roost is defined as a stand of mature or old growth conifer or cottonwood trees that harbors at least six bald eagles on any given night.

Although eagle population studies have revealed that both reproduction and survival are important, changes in survival rates seem to have more effect on the population than similar changes in reproductive rates (Grier 1980). Hypothetical population modeling indicates it is possible for eagle populations with lower reproduction but adequate survival to do better than other populations with higher reproduction but poor survival. Adult eagles must prepare themselves for the next breeding season, and subadults and immature eagles must survive stressful environmental conditions. Therefore, maintaining and/or improving winter survival is crucial to eagle recovery (USFWS 1978 and 1983).

Distribution

Historically, the bald eagle nested in at least 45 of the contiguous 48 states, with an estimated 250,000 - 500,000 bald eagles living on the North American continent before the first Europeans arrived. The breeding range of the bald eagle was greatly diminished during the nineteenth and twentieth centuries. Present-day breeding occurs primarily in northern California, Alaska, Oregon, Washington, Minnesota, Wisconsin, Michigan, Maine, the Chesapeake Bay area, Florida, the tri-state corner of Idaho, Montana, and Wyoming, and in parts of Canada. The

Service estimated the breeding population exceeded 5,748 occupied breeding areas in 1998 (USFWS 1999a). Bald eagles winter throughout the country, but are most abundant in the West and Midwest.

Bald eagles occur year-round in Wyoming. Wintering bald eagles generally occur in areas with open water on large water bodies and near concentrations of winter ungulates, waterfowl and/or fish (U.S. Department of Interior 1986, GYBEWG 1983, MBEWG 1994). Freedom from human disturbance is an important component of wintering habitat (Detrich 1978, Fitzner and Hanson 1979). Statewide surveys for nesting bald eagles were initiated in Wyoming in 1978 (Wyoming Game and Fish Department 1996). The Wyoming population has been increasing, and in 1994, 70 pairs attempted nesting, with a resultant 67 fledglings (Wyoming Game and Fish Department 1996). The greatest nesting concentration occurs in the Greater Yellowstone area. However, several breeding pairs also occur along major drainages throughout the State (Wyoming Game and Fish Department 1996).

Status and Threats

Wyoming falls within the area of the Pacific Bald Eagle Recovery Plan (USFWS 1986). The primary objective for this area is to provide secure habitat for bald eagles within the 7-state Pacific recovery area and to increase population levels in specific geographic areas to the extent that the species can be delisted. One recovery criterion is to have stable or increasing wintering populations.

The decline in nesting populations during the twentieth century has been attributed to habitat loss (identified as the most significant long-term threat to all bald eagle populations in the recovery area), environmental contamination, electrocution, shooting, poisoning, and trapping (USFWS 1986). These problems still exist today and are a growing concern (Hartman 2002). Numerous cases of bald eagle and golden eagle poisoning have been caused by landowners unlawfully misusing pesticides and other chemicals for predator control.

By the late 1960's, the pesticide dichloro-diphenyl-trichloroethane (DDT) and its metabolites had caused widespread reproductive failures and resulted in drastic decreases in eagle numbers continent-wide (Sprunt et al. 1973, Wieneuyer et al. 1972). Other contaminants such as polychlorinated biphenyls and heavy metals such as mercury and lead may contribute to increased eagle mortality in some areas. The exact impact of DDT and other contaminants on bald eagles in Wyoming is not known.

Secondary poisoning in eagles from eating lead-poisoned prey, particularly ducks and geese, was a concern identified in the early 1980's by Pattee and Hennes (1983). They reported that of 650 dead eagles, 7.2 percent probably died from lead poisoning. Their field evaluations in Missouri and Minnesota found 9-11 percent of digested eagle pellets contained lead shot. However, Lingle and Krapu (1988) found in a wintering eagle study (1978-1980) that cast pellets contained a small percentage (0.3 percent) of lead shot. Due to the use of nontoxic shot being phased in during the 1980's and now required in many areas across the nation, the potential for eagles to suffer ill-effects or death from lead shot ingestion has likely decreased.

Loss of eagle habitat continues to be the most significant long-term threat to bald eagle populations within the 7-state Pacific recovery area. Development, both urban and recreational, logging, mineral exploration and extraction, as well as others forms of human activity are adversely affecting suitable breeding, foraging and wintering habitats (USFWS 1986). The Pacific Bald Eagle Recovery Plan (USFWS 1986) identifies that the cumulative long-term effects of small scale actions and individual projects, while not jeopardizing the continued existence of the species, are the single most important threat to bald eagle recovery. Increased human activity and various land developments can adversely affect the suitability of breeding and wintering habitats (Juenemann and Frenzel 1972, Lish 1975, Grubb and King 1991).

As early as 1922 researchers noted the electrocution of raptors. However, not until the 1970's did researchers become aware of the magnitude of the problem. Franson et al. (as cited in Avian Power Line Interaction Committee (APLIC) 1996) summarized that 12 percent of the known bald eagle mortalities were the result of electrocution. Electrocution deaths of bald eagles have been documented across the country, including Wyoming (APLIC 1996). Between 1986 and 1996 electric utility company records from across the western United States and Canada showed that 118 bald eagles and an additional 358 unidentified eagles were electrocuted (Harness 2002). Bald eagles frequently congregate in large numbers during the winter (Stalmaster 1987). In predominately treeless areas, such as the Powder River Basin, power poles may be the only perches available to bald eagles.

Approximately 77 eagles have been electrocuted on power lines, including 1 bald eagle, in a 1 year period in the Powder River Basin (Domenici 2001). An unknown number of additional bald eagle kills have resulted from collisions with power lines (Domenici 2001). In Montana, within the Powder River and Billings Resource Management Plan (RMP) project area, bald eagle mortality from electrocution by small distribution power poles and collision with small distribution power lines common to oil and gas development was documented in 2000 and 2001 (Schomburg 2001). Data were collected from 303 carcasses from 1996-2001, with data from 273 carcasses collected in 2000 and 2001. Cause of death of 23 raptors were attributed to mid-span collisions, with 21 identified as golden eagle and 1 as bald eagle (Schomburg 2001). Causes of death of 280 raptors were attributed to electrocution, with 219 identified as golden eagle, 4 as bald eagle and 11 as either golden or bald eagles (Schomburg 2002).

Ute ladies'-tresses orchid

Ute ladies'-tresses orchid was listed as a threatened species on January 17, 1992 (57 F.R. 2048). Populations of the Ute ladies'-tresses occur in relatively low-elevation riparian meadows with concentrations in three general areas of the interior western United States: the Wasatch Front and west desert of Utah, the Uinta Basin in Utah, and the Front Range of Colorado and Wyoming (USFWS 1992). Ute ladies'-tresses was described by Sheviak (1984) based on material collected in Colorado and Utah. Previously, populations had been confused with other species of *Spiranthes* (USFWS 1992).

Description

Ute ladies'-tresses is a perennial, terrestrial orchid with stems 20 to 50 cm tall arising from tuberously thickened roots. Its narrow leaves are about 28 cm long at the base of the stem and become smaller in size going up the stem. Flowers consist of few to many small white or ivory flowers clustered into a spike arrangement at the top of the stem (USFWS 1992).

Life History/Habitat Use

Ute ladies'-tresses blooms from late July through August. However, depending on location and climatic conditions, orchids may bloom in early July or still be in flower as late as early October. The Ute ladies'-tresses is endemic to moist soils near wetland meadows, springs, lakes, and perennial streams. It occurs generally in alluvial substrates along riparian edges, gravel bars, old oxbows, and moist to wet meadows at elevations from 4,200 to 7,000 feet. The orchid colonizes early successional riparian habitats such as point bars, sand bars, and low-lying gravelly, sandy, or cobbly edges, persisting in those areas where the hydrology provides continual dampness in the root zone through the growing season. The species occurs primarily in areas where the vegetation is relatively open and not overly dense, overgrown, or overgrazed (Coyner 1989 and 1990; Jennings 1989 and 1990). Plants usually occur as small scattered groups and occupy relatively small areas within the riparian system.

Ute ladies'-tresses begins flowering at the end of July, although the inflorescence begins to emerge as early as June. Flowering duration depends upon moisture and light conditions, but may continue until early September. Reproduction appears to be strictly sexual with bumble bees as the primary pollinators (USFWS 1995). Fruit set occurs in late August through September. At the end of the growing season, small rosettes often emerge at the base of the plants and persist through the winter months. Two or more plants may occur in clumps, but it is not known whether these clumps are single or multiple individuals.

Arditti (as cited in USFWS 1995) indicated that orchids often have very small seeds requiring specific symbiotic associations with mycorhizal fungi for gemination. Many species of *Spiranthes* are initially saprophytic, underground plants that persist for many years before leaves emerge above ground (*S. spiralis* takes 11 years from germination to green leaf production, with 8 years spent in the mycorhizal stage) (USFWS 1995). Ute ladies'-tresses may be similar to other species of *Spiranthes* which bloom less often than annually (*S. spiralis* plants rarely flower in consecutive years and *S. magnicamporim* may bloom as rarely as once in 20 years) (USFWS 1995).

Distribution

Ute ladies'-tresses is currently known from western Nebraska, southeastern Wyoming, north-central Colorado, northeastern and southern Utah, east-central Idaho, southwestern Montana, and north-central Washington (Moseley 1998). In Wyoming, Ute ladies'-tresses is known to occur at four locations in Converse, Goshen, Laramie, and Niobrara counties. Range-wide the plant is now known from over 60 locations representing at least 30 populations (Fertig 2000).

Because of the plant's irregular flowering pattern, sites that have been surveyed with negative results in the past could still support populations (Mosely 1998). Fertig (2000) recommends high-quality sites be resurveyed periodically on the chance the species was not flowering or emergent during earlier visits.

Status/Threats

Due to the small size of most populations and the erratic population fluctuations noted within monitored populations, it is not known whether existing populations are demographically stable over the long term. The highly variable demographic structure from year to year of the species' largest known population may make it more vulnerable to extinction in years of low population numbers (USFWS 1992). The species' low population numbers and restricted habitat make it vulnerable to natural or human-caused disturbances. Extant populations in eastern Wyoming and
Colorado are typically very small and potentially vulnerable to habitat changes that could eliminate entire populations. Projects that affect the hydrology and vegetation of the species' riparian ecosystem may have a negative impact on the species (USFWS 1992).

The Ute ladies'-tresses is believed to be extirpated from most of its historical range due to alterations of stream morphology and hydrology. Hydrology of a stream is integral to the structure and function of the ecosystem (Busch and Scott 1995). Flow timing, flow quantity, and water table characteristics influence riparian vegetation (Pague and Grunau 2000). Specific levels of change in hydrology and how they affect Ute ladies'-tresses are not well understood, but Auble et al. (1994) did show significant vegetation changes after losses greater than 0.5 meters in ground water levels. Channelized and depleted streams are no longer capable of creating the semi-open habitats or maintaining the hydrologic conditions that sustain damp rooting zones throughout the growing season. The Service believes recovery of the species will involve management of stream habitats to retain, recreate, or mimic natural stream morphology and
hydrology and related vegetation dynamics. Projects that alter natural stream morphology and hydrology, change the vegetation of the species' riparian ecosystem, or cause direct ground disturbance may negatively affect the Ute ladies'-tresses where it is exists.

Crain (as cited in USFWS 1992) reports that the Ute ladies'-tresses orchid is highly palatable and is preferentially grazed by small herbivores. While excessive grazing is thought to be detrimental to the Ute ladies'-tresses, mild to moderate livestock grazing may be beneficial by reducing competing vegetation. Based on research involving habitat/population modeling by Arft (1995), the South Boulder Creek (Colorado) hay meadow colonies do not appear viable without human intervention. According to Arft's model, traditional winter grazing is necessary to maintain stable population growth. Mowing, if timed according to orchid phenology (modified to occur earlier so not to damage growing orchids), may achieve the same results. At this population, grazing and irrigation serve to maintain the ordinarily "natural" suitable conditions of reduced vegetative competition. However, depressed inflorescence and fruit production have been observed at sites that are grazed in late summer (Arft 1995 in Fertig 2000).

Other examples of adverse effects associated with grazing have been noted, but the overall effect of grazing on Ute ladies'-tresses appears to be low (Fertig 2000). The relationship between grazing and the establishment of redtop (*Agrostis stolonifera*) and certain noxious weeds is poorly understood, as are the impacts of grazing and trampling on insect pollinators (Fertig 2000). Many of the known remaining populations are relict in nature, remaining in small areas where livestock grazing was less intense than in other riparian communities within the species' range (USFWS 1992). Mowing can also be either beneficial by reducing competing vegetation or detrimental if done before fruit have ripened, or if the height of the cutting is too low, reduced fruit production may occur (Fertig 2000).

Mountain Plover[1]

The mountain plover was proposed for listing as a threatened species on February 16, 1999 (64 F.R. 7587). The mountain plover is a small bird, about the size of a killdeer (*Charadrius vociferus*), in the plover family (Family *Charadriidae*). The type specimen was collected in 1837 by J. K. Townsend on the Sweetwater River of Wyoming. There are no recognized subspecies.

Description

The mountain plover is a compact bird (about 7-9 inches long) with light brown above and paler underparts, lacking the contrasting dark breast bands typical of many other plover species. In flight, its underwings are white. Breeding plumage differs only by the addition of a dark line between the bill and eyes contrasting with a pale forehead. The bill is black, the legs are gray to light brown-yellow, feet are dark brown, and claws are black. The sexes are alike.

Life History/Habitat Use

The mountain plover is a migratory species of the shortgrass prairie and shrub-steppe ecoregions of the arid West. The universal characteristics of mountain plover habitat on both the breeding and wintering grounds are short vegetation, bare ground, and flat topography. They are found

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[1] Unless otherwise noted, the information provided in this section was taken from the proposed rule to list the mountain plover as threatened under the Act (64 F.R. 7587).

associated with plains, alkali flats, agricultural lands, cultivated lands, sod farms, prairie dog towns, and low shrubs at both breeding and wintering locales. Unlike other plovers, they are rarely associated with water.

In Montana, there is compelling evidence that mountain plovers are dependent on active prairie dog colonies for nesting (Dinsmore 2000). Mountain plover selectively use black-tailed prairie dog towns (*Cynomys ludovicianus)* for breeding, nesting, and feeding (Knowles and Knowles 2001, Dinsmore 2001, Dinsmore 2000, Olson-Edge and Edge 1987, Olson and Edge 1985, Olson 1985, Knowles and Knowles 1984, Knowles et al. 1982). However, not all prairie dog towns offer suitable habitat for mountain plovers, mostly due to topographic incompatibility. In addition, there are habitats other than prairie dog towns that provide nesting, feeding and breeding habitat for mountain plover in Montana. Knowles and Knowles (1998) demonstrated that barren areas with glacial till, stockwater sites grazed by cattle, sheep, and ground squirrels, dwarf shrub communities associated with silty overflow sites and bentonitic soils, all have some levels of documented mountain plover use. Livestock and/or bison (*Bison bison*) grazing on prairie dog towns will increase mountain plover use substantially (Knowles and Knowles 2001).

Knowles and Knowles (2001) still conclude that "based on historical notes and contemporary observations, viable populations of mountain plovers are probably dependent upon extensive areas of black-tailed prairie dog colonies."

The dependency of mountain plovers on prairie dogs in Montana is probably tied to two factors: habitat and food (Dinsmore 2001). Mountain plovers prefer to nest on flat, arid landscapes, especially in areas that are intensively grazed (Knopf 1996). In Montana, the only open, grazed habitat is found on active prairie dog colonies (Dinsmore 2001). Prairie dog colonies also harbor more food items than the surroundings habitats (Dinsmore 2001, Knopf 1996). Mountain plovers are insectivorous with beetles, grasshoppers, crickets, and ants as their principal food items (Rosenberg et al. 1991).

The nest of the mountain plover is a simple scrape on the ground, which may be lined with debris. Nests are usually placed in areas where vegetation is less than 4 inches in height, the amount of bare ground in the area exceeds 30 percent, and near a conspicuous object such as a manure pile or rocky area. In shortgrass prairie habitat, vegetation associated with nest sites includes *Bouteloua gracilis* (blue grama), *Buchloe dactyloides* (buffalo grass) and *Opuntia* spp. (prickly pear cactus). In shrub-steppe grasslands, vegetation around nests includes low-growing shrubs such as *Artemisia nova* (black sage) and *Atriplex gardneri* (Gardner saltbush) (Day 1994, Knopf 1996). Topography is typically flat or gently rolling. Nesting areas consistently have slopes less than 12 percent with the majority of plover sightings on slopes of less than 8 percent (Knowles et al. 1982, Parrish 1988, Beauvais and Smith 1999). Generally, "suitable mountain plover habitat" refers to areas containing these characteristics: low relief, vegetation generally less than 4 inches in height, and bare ground present and at least locally exceeding 30 percent of the area.

The breeding season begins soon after birds arrive in late March or early April. Breeding season displays involve different calls and flight displays, including "falling leaf" and pursuit flights to advertise territory occupancy and define boundaries between territories. Territories in Colorado are about 40 acres and adjacent territories may overlap significantly along boundaries. Breeding plovers show close site fidelity, often returning to the same territory in subsequent years. Territories tend to be aggregated with several breeding pairs occurring within a few square miles surrounded by empty but apparently suitable habitat (Knopf 1996).

Nests may be initiated 1-2 weeks after arrival on the breeding grounds and the clutch of 3 eggs may take 3-12 days to complete. Incubation lasts approximately 28-31 days (Ehrlich et al 1988). In Colorado, egg-laying began April 15, continuing through mid-June, with one late nest observed June 23 (Graul 1975). Adults were found to incubate or attend nests with increasing frequency and duration as the incubation period continued. Nest attendance in Wyoming increased from approximately 50 percent of daylight hours early in incubation to approximately 100 percent within days of hatching (Laun 1957). Eggs appear highly resistant to chilling but susceptible to overheating in the sun due to their dark coloration (Knopf 1996).

Chicks leave the nest soon after the last egg hatches. Chicks are usually attended by one adult, brooded about one-third of the time for the first day. Daily movements of the broods may be extensive, with broods ranging over as much as 200 acres between hatch and fledging. Chicks fledge approximately 33 days post-hatch (Knopf 1996).

Known predators of adult mountain plovers are few. Kit fox (*Vulpes macrotis*) and prairie falcon (*Falco mexicanus*) are the only documented predators of adults. However, their ground nests are vulnerable to mammalian predators including the thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*), swift fox (*Vulpes velox)*, badger (*Taxidea taxus)*, and coyote (*Canis latrans)*, and possibly corvids (crows, ravens and magpies). Ground squirrels, coyotes, Swainson's hawks (*Buteo swainsonii*), prairie falcons (*Falco mexicanus*), and loggerhead shrikes (*Lanius ludovicianus*) have been observed taking flightless young (Knopf 1996).

Species in the shorebird family are generally long-lived, with low annual reproductive rates and small clutch sizes. Available information on the mountain plover conforms to this pattern. Annual survival estimates for this species are unavailable, though over-winter survival is high, estimated at 0.9474 from a sample of 44 birds (Knopf 1996). Few data exist on the life span of the mountain plover, though one banded bird was recovered after 6 years.

Mountain plovers probably start breeding in their second year of life. Normal clutch size is three, very rarely four. Two-egg clutches probably result from predation of individual eggs.

Birds are largely monogamous, though the pair bond is only maintained for a short period during breeding.
There is some evidence that at least some females lay two clutches, one brooded by the male and the other by the female, with this strategy common in some years (Knopf 1996).

Nest success has been estimated to vary from 26-65 percent between years and may be influenced by rainfall. Mountain plovers in Weld County, Colorado, fledged an estimated 0.26 and 1.4 young per nest in different studies between 1969 and 1974, though the higher estimate is believed to be biased by the exclusion of nests which totally failed (Knopf 1996). In Phillips County, Montana, annual nest success was between 45 percent in 1999 and 72 percent in 2000 with a average annual nest success of 58 percent for 600 nests pooled across years (Dinsmore 2001).

Distribution

Mountain plovers occupy suitable breeding habitat in many of the Great Plains states from Canada south to Texas from late March through July. Flocks may form as early as mid-June prior to migration to wintering habitats in August through October. Wintering areas are concentrated in the Central Valley of California, Texas and Mexico. There are no wintering areas in Wyoming. Historically, the mountain plover was considered numerous on breeding grounds in western and central Kansas and Oklahoma, western Nebraska and South Dakota, and eastern Colorado, Montana, and Wyoming.

Montana, Colorado and Wyoming have the majority of breeding mountain plovers, although some breed in Kansas, Nebraska, New Mexico, and Oklahoma (USFWS 1999b). Approximately 1,500 birds are estimated to occur in Wyoming. Birds have been observed during the breeding season over much of the shortgrass prairie of the eastern parts of the State, with high densities reported in the Laramie Plains of northern Albany County and eastern Carbon County (Laun 1957, Johnson et al. 2000), Converse County (Parrish 1988), Laramie County (Graul 1975), Park County (U.S. Bureau of Land Management 1988), and Sweetwater County (Beauvais and Smith 1999).

Status and Threats

The mountain plover was designated a category 2 candidate species on December 30, 1982 (47 F.R. 58458), meaning that the species may be declining but more information was needed. The Service elevated its status to category 1 candidate in the 1994 Annual Candidate Notice of Review (59 F.R. 58982), meaning that listing was warranted, but precluded by higher priority species. In 1996, the Service did away with candidate categories 2 and 3, re-defining candidate species to include only former category 1 candidate species (61 F.R. 64481). The mountain plover was retained as a candidate species in the 1997 status review (62 F.R. 49298). The species was petitioned for listing as threatened on July 7, 1997. Due to its candidate status, no

90-day finding was required in response to this petition. On February 16, 1999, the Service gave notice of a proposal to list the mountain plover as a threatened species pursuant to the Act (64 F.R. 7587). A final listing decision on this species is pending.

Endemic grassland birds have declined more rapidly than other bird species, and the mountain plover's decline is greater than the other grassland endemics (Knopf 1994, Sauer et al. 1997). Available data indicate that population numbers of mountain plovers have declined range-wide by more than 50 percent since 1966 to fewer than 10,000 birds. The eastern extent of the range has been greatly reduced, possibly due to conversion of native prairie to cultivated agriculture as well as control of burrowing rodents. Mountain plovers are no longer known to breed in Canada or South Dakota.

Identified or suspected reasons for the decline include conversion of shortgrass and shrub steppe habitats, changes in range management to emphasize uniform grass cover, declines in native ungulates and burrowing animals, oil and gas development and associated road construction, and possibly population sinks created by certain agricultural practices. A population 'sink' (Pulliam 1988) is an area within the breeding range of a species or population where reproduction is not adequate to balance mortality, but population levels are maintained by immigration of breeders produced in a nearby 'source' area.

Strategies adopted by the Forest Service and the Bureau, should be effective in minimizing impacts on Federal lands, but the likelihood of these measures being implemented on split-estate lands or private property is less than for the activities on Federal lands (USFWS 1999b). The time-of-year and spatial buffers adopted by the Forest Service and the Bureau to protect nesting mountain plovers would only have value when the essential nesting characteristics are not permanently altered. In the absence of such provisions, however, and given the current rate of oil and gas development, the Service believes that oil and gas development could be a threat to mountain plovers and their habitat (Brockway 1992).

Black-footed ferret

We concur with your determination that the action is not likely to adversely affect the black-footed ferret (*Mustela nigripes*). This concurrence is based upon the Bureau's commitments to (1) locate project activities to avoid impacts to prairie dog colonies that meet Service criteria as suitable black-footed ferret habitat (1989) wherever possible; (2) conduct ferret surveys in suitable habitat, regardless of burrow density, and (3) allow no disturbance within prairie dog colonies that are found to be inhabited by black-footed ferrets.

ENVIRONMENTAL BASELINE

Bald Eagle

There are 10 historically active bald eagle nests within the Powder River Basin Oil and Gas

Project area. Forty-two bald eagle winter roosts have been documented within the project area. However, our records do not identify how many bald eagles have been observed at each roost site. The eastern front of the Big Horn Mountains and the Powder River Basin is a known wintering area for bald eagles. Sightings of bald eagles are common during the winter months in the project area. Due to the large proportion of private land within the project area which have not been surveyed, additional winter roost sites likely exist.

Historically, these bald eagle nests and winter roosts have been affected by relatively few activities. Grazing has been the predominant land use in the area and has likely had only minimal effects on the eagles and their habitat, although some impacts to riparian areas may have occurred. Conventional oil and gas development continues to occur in the Powder River Basin with 4,351 conventional oil and gas wells completed as of December 31, 2001 (Likwartz 2002). Drilling for CBM in the Powder River Basin began in 1985. As of May 29, 2002, 13,306 CBM wells have been drilled with roughly 9,000 wells in production (Likwartz 2002). Additionally, the project area is heavily impacted by coal mining operations. Currently surface lands are being disturbed by coal mining activities at a rate of approximately 2,000 acres per year. Coal mining has disturbed 54,000 acres within the project area. At least 26,610 additional acres of land proposed for coal mine expansion is presently included in the Bureau's pending Lease by Application process. Other mining activities within the Powder River Basin include uranium mining (approximately 4,400 acres disturbed), sand, gravel and scoria mining (combined disturbance 1,200 acres). Agricultural development has resulted in the conversion of approximately 113, 643 acres of native short-grass prairie (FBA 2002).

Ute Ladies'-tresses

Ute ladies'-tresses is currently known from four sites in eastern Wyoming, including: a small population along a tributary to Antelope Creek (a tributary to the Cheyenne River) in northwest Converse County; a population along Bear Creek in southwestern Goshen County; a population along the Niobrara River near McMaster's Reservoir in southeastern Niobrara County; and, a population along Sprager Creek in Laramie County. These populations are monitored on a limited basis and appear to be stable. Mowing and grazing occur at two of the sites and appear to have only minor impacts on the populations.

Few surveys for Ute ladies'-tresses have been conducted in the project area. However, the population along a tributary to Antelope Creek in Converse County occurs on Bureau land just upstream of the project area. This population was originally discovered in 1994 and has been censused several times since then. The population remains small (11-35 plants seen during various years). The habitat is considered marginal and the population is the least viable of the populations within Wyoming (Fertig 2000).

If large areas of suitable habitat occur in the project area, it is likely they would have been surveyed for Ute ladies'-tresses already. Likewise, if large, stable populations of the plant occur in the project area, it is likely they would have been discovered by now. However, that does not preclude the possibility of smaller patches of suitable habitat or smaller populations having gone undetected to date.

Human activities that have detrimentally affected Ute ladies'-tresses and continue to pose a threat include stream alterations such as channeling, diversions, culverts, and levees; wetland filling; gravel mining; and introduction of exotic or aggressive plant species. All of these activities have

occurred historically and continue, although less frequently. These activities have been documented to directly affect orchid colonies when they occur on site or may indirectly affect the orchids and their habitat when taking place upstream or adjacent to existing orchid colonies.

Direct herbivory of Ute ladies'-tresses by livestock and deer has been observed on occasion and may be considered to be detrimental. Some grazing outside of the Ute ladies'-tresses growing season has been shown to be beneficial by reducing competition. However, the small size of the population of Ute ladies'-tresses located near the project area may be due to poor seed production resulting from grazing of fruiting stalks (Fertig 2000).

Coal mining has been a major influence in the southern part of the project area and has adversely affected Ute ladies'-tresses habitat in some areas. Coal bed methane development may also be having an adverse effect on Ute ladies'-tresses. The water produced by more than 9,000 wells in production (in 2001 approximately 6,400 wells produced 182 acre-feet per day, (Likwartz 2002)) may have altered hydrology significantly enough to affect Ute ladies'-tresses in some areas. However, few surveys have been completed and no data have been collected to assess possible effects of CBM development and associated discharges of produced water.

Mountain Plover

As indicated in the FBA, mountain plovers are likely to be found on suitable habitat throughout the entire project area. Mountain plovers are most often associated with relatively flat (less than 12 percent slope), open shortgrass prairie rangelands, often on or near prairie dog towns and other grazed areas. Plovers are also known to occur in sagebrush grasslands with sparse vegetation. Much of the Powder River Basin is characterized by level to gently rolling uplands dominated by sagebrush, with true shortgrass prairie occurring in the southern portion of Campbell County (Postovit 2000). However, much of the project area is not flat enough to be considered suitable habitat. Prairie dog towns are scattered throughout the project area, particularly in the southeastern and northwestern portions. Based on modeling which defines suitable habitat as an area of land on which the predicted probability of mountain plover being found during the breeding season is equal to or greater than 50 percent, there may be approximately 624,000 acres of suitable habitat for the mountain plover in the analysis area Beauvais and Smith, in press). Livestock grazing is the primary land use in the project area, with some areas heavily grazed.

The Bureau contracted with the Wyoming Natural Diversity Database and Western EcoSystems Technology Inc. to conduct presence/absence surveys for mountain plover in the Powder River Basin during the spring of 2001. A combined total of seven mountain plovers were observed within the Powder River Basin analysis area (Keinath and Ehle, 2001; Good, Young and Eddy, 2002). However, both reports qualify their results by noting that due to private landowner considerations survey routes were limited to public roads. Because much of the Powder River Basin is privately owned, areas of suitable habitat were inaccessible and not surveyed. Therefore, the results of these surveys likely underestimate the extent of use of suitable habitat by mountain plovers within the Powder River Basin.

A number of mountain plover sightings and breeding observations have been recorded in the southeast portion of the project area. Although survey effort in the rest of the project area has been less intensive, mountain plovers have been observed. Coal mine monitoring data provide some indication of the suitability of habitat for and presence of mountain plovers on a portion of the project area. Several mines (Buckskin, Rawhide, Eagle Butte, Belle Ayr, Coal Creek, Black Thunder, and North Rochelle) have no observations of mountain plovers since monitoring of these mines began (generally in the mid-1980's). Typically, the vegetative type and lack of intensive grazing results in cover too dense and tall to be considered mountain plover habitat at these mines (Postovit 2000). The Caballo and Antelope mines have recorded mountain plover use. Although most of the permit area is not suitable habitat, plovers were documented using a saline grassy area within the Caballo mine permit area in 1992. Adult plovers were observed annually on black-tailed prairie dog towns within the North Antelope/Rochelle permit area from 1994 through 1998 (Howard Postovit, Powder River Eagle Studies, *in lit*. 1999). At the Antelope mine, breeding plovers have been documented on or near the mine in every year but one since 1982 (Postovit 2000). Additionally, Postovit (2000) indicates the vegetation in the area has been heavily impacted by intensive livestock grazing, thus producing abundant potential habitat for the plover at Antelope mine and, generally, in that area of the Powder River Basin.

Grazing is the primary land use in the project area and appears to be compatible, and probably beneficial, to the plover. Coal mining has been a major influence in the southern part of the project area and has adversely affected plover habitat in some areas. Conventional oil and gas development continues to occur in the Powder River Basin with 4,351 conventional oil and gas wells completed as of December 31, 2001, (Likwartz 2002). Drilling for CBM in the Powder River Basin began in 1985. As of May 29, 2002, 13,306 CBM wells have been drilled with roughly 9,000 wells in production (Likwartz 2002). The presence of low density oil and gas pads may provide suitable nesting habitat for mountain plovers (Day 1994). However, no data exist for the determination of what density of oil and gas (including CBM) development may adversely affect nesting mountain plovers.

EFFECTS OF THE ACTION

Bald Eagle

Bald eagles may be affected by the project in several ways, including disturbance by humans and equipment noise and direct injuries and/or mortality by electrocution and collision with power lines and vehicles. Bald eagles often forage on carcasses of other animals, particularly in the winter when aquatic food resources are not as readily available. Elk (*Cervus elaphus nelsoni*), mule deer (*Odocoileus hemionus*), white-tailed deer (*Odocoileus virginianus*), and antelope (*Antelocapra americana*) use the project area. Several small mammals, as well as game birds and passerines, are also common in the area. An increase in available water resulting from CBM development in the project area may result in increased forage and cover for many of these species, as well as increased drinking water. This may result in increased populations of some wildlife in the project area. With the increased volume and frequency of vehicular traffic, there is a high probability of increased wildlife mortality due to vehicular collisions.

Bald eagles may be affected by disturbance near nest sites. Mineral exploration and extraction, including coal bed methane development, conventional oil and gas development, as well as others forms of human activity can adversely affect suitable breeding, nesting, and foraging habitats. Much of the project area is devoid of significant human disturbance, with grazing as the major land use. Nesting eagles may be unaccustomed to activities involving large equipment and significant human activity for even a short period of time, such as with drilling, construction of power lines and road building. However, with only ten active bald eagle nests within the project area, mostly in riparian habitat along the western edge of the project area, and the Bureau's commitment to implement the conservation measures as described in the project description section of the Bureau's FBA the Service does not anticipate the project will cause the abandonment of an active nests or nest sites.

Additionally, bald eagles may be affected by disturbance near winter roost sites and perch areas. Much of the project area is devoid of significant human disturbance, especially during the winter. Many of the eagles wintering in the area may be unaccustomed to activities involving large equipment and significant human activity for even a short period of time, such as with drilling, construction of power lines and road building. Some eagles may lose foraging opportunities and could even choose to abandon the roost sites completely, depending on the level of activity. The Bureau's commitment to maintain a year-round 0.5 mile disturbance-free buffer zone (i.e., no surface occupancy) around roost sites and an additional seasonal buffer zone of 0.5 mile (November 1 - April 1) from the outside boundary of the 0.5 mile year-round disturbance-free buffer zone and extending out an additional 0.5 mile, will lessen the likelihood of roost abandonment. However, the lack of information regarding roost site locations on private land and the lack of surveys for roost sites may leave some roost sites vulnerable to abandonment from human disturbance. For the purposes of this Biological and Conference Opinion a disturbance-free buffer zone is defined as an area where no permanent or semi-permanent physical structures (*e.g.* wells, roads, power lines, etc.) will be constructed nor will any human activity associated with the project be allowed without prior coordination and written concurrence of the Service's Wyoming Field Office.

Specific phases of oil and gas development and the specific activities that may cause take are outlined below.

Bald eagles may be affected by the project in several ways, including human disturbance, equipment noise, electrocution, collision with power lines and construction of new roads which could result in collisions with vehicles.

Development and Operation: The Service believes that as a direct result of the construction of approximately 7,136 miles of new improved roads and 5,311 miles of overhead distribution lines, there will be direct loss of bald eagles. The Bureau's FBA states that increased traffic, road kills and carrion, resulting from CBM activities, potentially increases vehicle collision hazard to bald eagles. Bald eagles often forage on carcasses of other animals, particularly in the winter when aquatic food resources are not as readily available. Foraging may also be intensified during the nesting period while adults are feeding nestlings. If there is an increase in carcass availability as a result of collisions with vehicles in the project area or increased big game hunter harvest spoils, bald eagles may increase foraging activities in the project area. Regardless of the Bureau's commitments to implement measures to lessen the likelihood of collisions, some will probably occur.

Above-ground transmission facilities even with proper design and construction requirements (APLIC 1996), can still pose an electrocution threat to bald eagles. Power lines also pose strike hazards for bald eagles, especially near perennial rivers and water bodies that support fish and waterfowl. Removal of large trees in wintering areas, particularly at established roost sites, would also displace bald eagles by removing perch and roost sites. Even though operators may adhere to all the requirements for construction of new power lines or modify existing power lines to be raptor friendly, some eagles may still be lost to line strikes or electrocution.

Reclamation and Abandonment: The Bureau has committed to seasonal and temporal buffers of bald eagle nests and winter roost sites, and surveys in suitable nesting and winter roost habitat for bald eagles where avoidance is not possible. However, reclamation of drill pads, roads, and pipelines will involve an increase in traffic, noise, and human activity from operation-level activities, possibly leading to direct take as well as disturbance and displacement of bald eagles from nests and winter roost sites in the area. Reclamation activities initiated during the breeding season, unless adequate surveys determine no nesting birds are present, may lead to nest failure by displacing attendant adults.

Interrelated and Interdependent Effects: The highly interspersed surface and mineral ownership on the analysis area creates challenges for protection of bald eagles and their habitats. There will be some actions regarding non-Federal surface and/or minerals that would not occur but for a Federal action (i.e., they are interrelated or interdependent to the Federal action). Rights-of-way for access to non-Federal in holdings is an example of a common Federal action leading to interrelated and interdependent actions on non-Federal lands. Development of non-Federal minerals occurring as a result of a Bureau action would have the same effects on bald eagle nests and roost sites as such development of Federal minerals, described above. To the extent that these actions are interrelated or interdependent to a Federal action, any effects to bald eagles associated with development of non-Federal minerals must be considered prior to permit issuance or other authorization by the Bureau.

Ute Ladies'-tresses

Potential suitable habitat for the Ute ladies'-tresses occurs in the project area. Published documents and ongoing research on the plant, its habitat, and the hydrology of the areas occupied by and adjacent to this plant suggest possible adverse effects threatening the continued survival as a consequence of streamflow alteration. The data and information collected thus far are insufficient to ascertain exactly what effect water depletions or accretions and changes in timing of naturally occurring flows would have on the natural hydrology of the water table of habitats dependent upon project area streams. The produced water may reduce or increase Ute ladies'-tresses habitat depending on amount and timing of discharges, stream geomorphology, precipitation, and other factors.

Specific phases of oil and gas development and the specific activities that may cause take are outlined below.

Development: Direct impacts from construction may also occur. Due to the ability of Ute ladies'-tresses to persist below ground for years before emerging, negative findings resulting from single surveys in suitable habitat prior to disturbance do not guarantee the plant is not present. If the plant is present, loss of the entire population or some part of it may occur if there is surface disturbance in the plant's habitat or if the hydrology is significantly changed.

Operation: Discharge of water into stream systems where the plant exists may result in some adverse effect due to erosion and other changes in the stream corridor. Flows in some streams may be only slightly augmented by discharged water and may increase existing habitat or create habitat in areas where it would not have existed naturally, actually resulting in a beneficial affect to Ute ladies'-tresses. Impacts to the water table could result in significant drying and vegetative changes in some areas. Flows in some streams may be only moderately or minimally reduced due to impacts to the water table and Ute ladies'-tresses may be unaffected in these cases.

Produced water often contains high concentrations of dissolved salts, making it unsuitable for irrigation and toxic to native plants. Soil irrigated with this water will accumulate salts which destroys soil structure and inhibits water uptake by plants. The sodium absorption ratio (SAR) of produced water typically is 10-12 times the level beyond which soil will maintain structure to support plant productivity (Bauder, 2002b). While there is debate over absolute values for acceptable limits for SAR, there is consistent agreement that high SAR water is a source of significant impairment of many soils, particularly irrigated soils and soils of arid or semi-arid regions (Bauder 2002a). Consequently, populations of Ute ladies'-tresses could be adversely affected by or eliminated by upstream surface discharges of produced water.

Abandonment and Reclamation: Although the Bureau has committed to avoidance of Ute ladies'-tresses orchid habitat where possible, and surveys in suitable habitat for Ute ladies'-tresses where avoidance is not possible. However, reclamation of drill pads, roads, and pipelines will involve an increase in ground disturbing activities from operation-level activities, possibly leading to disturbance of suitable habitat for Ute ladies'-tresses in the area. Reclamation activities, unless adequate surveys to determine no Ute ladies'-tresses orchids are present, may result in the loss of individual plants or small populations of this orchid. To minimize these potential affects, reclamation efforts by the Bureau in previously suitable Ute ladies'-tresses habitat will include seeding of vegetation to produce suitable habitat for the Ute ladies'-tresses orchids.

Interrelated and Interdependent Effects: The highly interspersed surface and mineral ownership on the analysis area creates challenges for protection of the Ute ladies'-tresses orchid and suitable habitat. There will be some actions regarding non-Federal surface and/or minerals that would not occur but for a Federal action (i.e., they are interrelated or interdependent to the Federal action). Rights-of-way for access to non-Federal in holdings is an example of a common Federal action leading to interrelated and interdependent actions on non-Federal lands. Development of non-Federal minerals occurring as a result of a Bureau action would have the same effects on the Ute ladies'-tresses orchid as such development of Federal minerals, described above. To the extent that these actions are interrelated or interdependent to a Federal action, any effects to this orchid associated with development of non-Federal minerals must be considered prior to permit issuance or other authorization by the Bureau.

Mountain Plover

Disturbance leading to loss of reproductive potential may occur in several ways. Effects to nesting plovers are likely depending on the onset, duration, and frequency of human disturbance. Aside from direct take of nests, chicks, and adults through vehicle collision, human disturbance may cause loss of eggs or chicks if attending mountain plover adults are displaced long enough to expose the eggs or chicks to excessive heating, chilling, or predation.

If disturbance occurs more frequently than weekly through the breeding season, nesting birds may be displaced and may initiate nests a secure distance from the disturbed area. While this may reduce the amount of nest failure from disturbance, it may nonetheless result in reduced plover reproduction if plovers are displaced to less suitable nesting areas. Indeed, significant amounts of previously occupied habitat may be made unavailable in this way. Preliminary data from the Foote Creek Rim suggest that breeding plovers may be displaced from areas of high human activity (WEST, Inc. 1999). Typical mountain plover habitat is level to slightly sloping ground usually associated with black-tailed prairie dog towns; these same areas are prime locations for oil and gas development and CBM exploration and development in particular (BA For Coal Bed Methane Production in Montana (MT Assessment 2002)). Therefore, the Service assumes that a high percentage of development will occur in areas such as prairie dog colonies and mountain plover habitat (MT BA 2002). If nesting birds are displaced to nest in less suitable habitat where nesting success is lower, this would result in lost breeding potential. Additionally, nesting mountain plovers outside of the disturbance area may be displaced by the relocation of mountain plovers disturbed by drilling activities.

If disturbance begins after the onset of nesting or occurs at intervals greater than two weeks apart, birds may have already initiated nesting within the disturbance area. Then, human activity causing displacement of incubating adults from active nests may result in addling eggs due to extremes of temperature or destruction of eggs by predators. During incubation, the mountain plover is fairly insensitive to human disturbance from vehicles as close as 3 meters but may be displaced from the nest by a human on foot at a much greater distance. Eggs or newly hatched chicks may also be crushed by vehicle traffic at any speed. Additionally, the presence of dogs greatly increases the distance at which plovers leave their nests, thus exposing the eggs to predation, chilling, and other adverse effects (Knopf 2002a).

Human disturbance is especially problematic where human activity has created disturbed areas attractive to nesting mountain plovers. In Utah, mountain plovers have been found to nest as close as 6-meters from open roads or operating oil well pads (Ellison et al. 1999), presumably attracted by the abundance of bare soil. Creation of apparently suitable habitat with high levels of human disturbance may actually attract breeding plovers to an 'ecological trap' (Pulliam 1988) where nests are initiated but fail due to disturbance and reproductive effort is wasted.

Mountain plovers are attracted to roads (Knopf 2002b) and are known to lead broods onto roads to forage at night (Laun 1957, Ellison et al. 1999). Direct loss of chicks or even adults to vehicle collisions may increase where increasing traffic volumes correspond with concentrations of nesting and brood-rearing activity. The Bureau's commitment to establish 25 miles per hour speed limits on project roads within 0.5-mile of known nesting areas should help reduce the likelihood of such collisions. However, because the birds may freeze and squat close to the ground in response to approaching vehicles, some level of mortality is likely.

In addition to activities that may lead to direct mortality of adults or young, and reduced production, several factors may lead to indirect mortality. The eggs and young, and to a lesser extent adults, are susceptible to a number of avian and mammalian predators. These include corvids (ravens, magpies, crows), birds of prey (hawks and owls), coyotes, badgers, weasels (*Mustela* spp.), and foxes (*Vulpes* spp.). These predators may benefit from human activities in a number of ways. Power poles, fence posts, associated gas facilities, and other elevated structures may provide new hunting perches and nest sites for avian predators, increasing their hunting effectiveness and range. Buildings, trailers, and other permanent structures may provide safe den sites for mammalian predators. The Bureau's commitment to minimize hunting perches within 0.5-mile of nesting areas will help minimize potential adverse effects.

Finally, an increase in road-killed animals due to more roads and heavier traffic may provide an increased food supply for both avian and mammalian predators, most of which are also scavengers. This increased food source may increase predator population size and may also extend predators range into previously uninhabited areas, leading to higher rates of predation on mountain plover eggs, chicks, and even adults. Such an ecological relationship has been demonstrated in the Mojave Desert of California. Increases in roads and traffic have extended the range of avian predators such as the common raven (*Corvus corax*) and red-tailed hawk (*Buteo jamaicensis*) exposing young desert tortoises (*Gopherus agassizii*) to much higher rates of predation than before development (Knight et al. 1993, Knight and Kawashima 1993). The Bureau's commitment to establish 25 Miles per hour speed limits on project roads within 0.5 mile of known nesting areas should help reduce the availability of carrion to attract predators.

Mountain plovers show high site fidelity to breeding territories between years and the persistence of breeding concentrations may be more important than mere availability of apparently suitable habitat for the persistence of the mountain plover. The necessity of social facilitation for effective breeding has been demonstrated in a number of avian species. Habitat degradation occurring outside of the breeding season may cause take in the form of harm by causing abandonment of historically used breeding areas, though no direct take of plovers, eggs, or chicks
occurs. Harm would result if removal or degradation of nesting habitat on historically used sites resulted in loss of breeding capability upon the birds' return, and/or resulted in loss of the pair for
lack of available feeding or nesting habitat.

The key issue is whether or not birds displaced by project activities will move to new areas and successfully breed. Currently, information is inadequate to answer this question. While unoccupied areas meeting our understanding of suitable habitat exist, this could mean either that science has not accurately described suitable plover breeding habitat and these areas are not actually suitable, or that they are suitable and the mountain plover is currently not limited by availability of breeding habitat. Until the question is resolved the prudent management approach must be to identify and protect all breeding concentrations of the species.

Specific phases of oil and gas development and the specific activities that may cause take are outlined below.

Development: The construction of roads, well pads, and ancillary facilities that degrade habitat in historically used breeding areas could result in abandonment of these breeding areas, whether or not the construction occurs during the breeding season. Given the Bureau's existing commitment to survey for plovers and delay work either 37 days, or 7 days post-hatch if any mountain plover nests or broods are found within 1/4 mile of development, the likelihood of ground-disturbing activities (including construction of roads, well pads, pipelines, ancillary facilities) causing direct lethal mortality of plovers would be diminished. However, human activity associated with project development and operation in historically used breeding areas may harass nesting birds enough to cause them to abandon the breeding area, particularly if disturbance extends over more than one breeding season. This could constitute harm to reproductive success. Additionally, increased traffic to and from other project construction sites may cause direct mortality through collisions with vehicles, and indirectly cause mortality by increasing predator numbers (by providing road-killed animals), thereby possibly increasing predation on adults, eggs, or chicks. However, it should be noted that the Bureau's commitment to post 25-miles per hour speed limits within 0.5-mile of identified nesting areas reduces the likelihood of such effects.

Drilling operations may displace breeding mountain plovers some distance from the pad, making additional nesting habitat unsuitable for some distance around the drill rig, and may constitute harassment. Traffic and risks of vehicle collision will greatly increase during drilling. Any of these factors that incrementally reduce the habitat quality leading to abandonment of a previously used breeding area, or reduced reproductive success, may constitute "incidental" take.

Operation: Though traffic will greatly decrease after construction, operating wells will still require periodic maintenance and visits, thereby maintaining low levels of impact associated with traffic and human activity. Elevated structures (such as power poles, water storage tanks, etc.) on the well pad could provide new nest and perch sites for corvids (i.e., common raven and black-billed magpie) and birds of prey, including ferruginous hawks (*Buteo regalis*), golden eagles, great horned owls (*Bubo virginianus*), and loggerhead shrikes. Presence of these known or suspected predators of mountain plovers and their eggs and chicks will increase the likelihood of mortality. The Bureau's commitment to minimize hunting perches within 0.5-mile of nesting areas will help minimize the effect. Maintenance of producing wells during the breeding season will occasionally produce levels of traffic, noise, and human activities that could lead to direct take of mountain plovers or displacement from the vicinity of the well pad. Recreational use of the new road system will cause increased disturbance and risk of vehicle collisions. Any of these factors that result in direct mortality of mountain plovers or that incrementally reduce the habitat quality leading to abandonment of a previously used breeding area or reduced reproductive success would constitute take.

Abandonment and Reclamation: Although the Bureau has committed to avoidance of mountain plover habitat where possible, and surveys in suitable habitat for mountain plovers where avoidance is not possible. Reclamation of drill pads, roads, and pipelines will involve an increase in traffic, noise, and human activity from operation-level activities, possibly leading to direct take as well as disturbance and displacement of nesting plovers in the area. Reclamation activities initiated during the breeding season, unless adequate surveys determine no birds are present, may crush eggs or chicks or lead to nest failure by displacing attendant adults.
Placement of a marker to identify plugged wells may provide a permanent hunting perch for avian predators, increasing mortality risk to mountain plovers or displacing breeding birds from

suitable habitat. However, in the FBA and enclosed CM, the Bureau indicated that markers would be less than 4 feet tall with perch inhibiting devices on top, thus reducing these potential affects. In addition, reclamation efforts by the Bureau in previously suitable mountain plover habitat will include seeding of vegetation to produce suitable habitat for mountain plovers. Plant species that produce a long-lasting stand of tall, dense vegetation will preclude nesting by mountain plovers as long as that vegetation persists.

Interrelated and Interdependent Effects: The highly interspersed surface and mineral ownership on the analysis area creates challenges for protection of mountain plovers and their habitats. There will be some actions regarding non-Federal surface and/or minerals that would not occur but for a Federal action (i.e., they are interrelated or interdependent to the Federal action). Rights-of-way for access to non-Federal in holdings is an example of a common Federal action leading to interrelated and interdependent actions on non-Federal lands. Development of non-Federal minerals occurring as a result of a Bureau action would have the same effects on nesting plovers or historically used breeding areas as such development of Federal minerals, described above. To the extent that these actions are interrelated or interdependent to a Federal action, any effects to mountain plovers associated with development of non-Federal minerals must be considered prior to permit issuance or other authorization by the Bureau.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

The cumulative effects are difficult to quantify for several reasons. Because surface ownership within the project area is primarily private and approximately half the oil and gas rights are privately owned, many new wells and many miles of roads, pipelines and power lines are reasonably certain to occur on private lands with no Federal nexus. This is evidenced by the current and historic rates of CBM development on private land throughout the Powder River Basin. The DEIS identifies 12,077 CBM wells already drilled or permitted for drilling on private surface/private minerals within the project area. Since publication of the DEIS the number of CBM wells already drilled or permitted for drilling on private surface/private minerals within the project area has risen to 14,116 CBM wells (Litwartz 2002). Therefore, we anticipate that future CBM development will continue. However, some of the gas development activities on non-Federal land will require grants of right-of-way from the Bureau for access and are, therefore, interrelated and interdependent to the right-of-way grants. These grants and interrelated and interdependent actions constitute Federal actions subject to review under section 7 of the Act and therefore are not considered under cumulative effects.

Four to six new power generation plants and connecting high voltage distribution lines have been proposed for the Powder River Basin. However, at this time it is unclear how many of these power plants and distribution lines will actually be built. Furthermore, it is unclear if there will be section 7 consultation for these projects. North American Power Group contends that the Two Elk power plant, if constructed as proposed, would not require section 7 consultation. Regardless, the construction of powerplants, infrastructure and high voltage distribution lines would result in additional loss of wildlife habitat and additional mortality of raptors and bald eagles in particular from collisions with power lines and electrocutions.

Finally, the data are not adequate to determine the distribution and abundance of the bald eagle, Ute ladies'-tresses, or mountain plover on private lands in the project area. Likewise, there are no accurate estimates of suitable habitat for these species on private lands, though such habitat likely occurs throughout the area. For this reason, the extent of cumulative effects to the species is difficult to quantify. However, given the surface and gas ownership patterns, as well as the current level of development of this private CBM, the direct and indirect effects of these private actions are likely to adversely affect the species addressed in this opinion in a similar manner and to a similar degree as those Federal actions addressed in this opinion.

CONCLUSION

Bald Eagle

After reviewing the current status of the bald eagle; the environmental baseline for the action area; the effects of the Powder River Basin Oil and Gas Project; and the cumulative effects, it is the Service's biological opinion that the direct and indirect effects of the Powder River Basin Oil and Gas Project, as proposed, are not likely to jeopardize the continued existence of the bald eagle. No critical habitat has been designated for this species, therefore, none will be affected.

The Service has reached this conclusion by considering the following:

1. The bald eagle has experienced significant recovery across its range since the banning of DDT.
2. The project area encompasses a relatively small amount of the bald eagle's entire range.
3. The project area supports 10 active bald eagle nests. However, the Bureau has committed to a 1-mile buffer for all active bald eagle nests.
4. A relatively small number of roosts sites will potentially be adversely affected by the project.
5. Construction, the activity most likely to adversely affect the birds, will be of a short duration and minimized by spacial and timing stipulations.

Ute Ladies'-tresses

After reviewing the current status of the Ute ladies'-tresses; the environmental baseline for the action area; the effects of the Powder River Basin Oil and Gas Project; and the cumulative effects, it is the Service's biological opinion that the direct and indirect effects of the Powder River Basin Oil and Gas Project, as proposed, are not likely to jeopardize the continued existence of the Ute ladies'-tresses. No critical habitat has been designated for this species, therefore, none will be affected.

The Service has reached this conclusion by considering the following:

1. Given the general characteristics of the project area, it is likely any suitable habitat or populations of Ute ladies'-tresses are relatively scattered and small.
2. While the project area is relatively large, it is not part of one of the three major areas of known Ute ladies'-tresses concentrations.
3. There is only one small population known to exist within the project area.
4. The Bureau has committed to avoidance of suitable habitat where possible and surveys for the plant if avoidance of suitable habitat is not possible.

Mountain Plover

After reviewing the current status of the mountain plover; the environmental baseline for the action area; the effects of the CBM development in the project area; and the cumulative effects, it is the Service's conference opinion that the direct and indirect effects of the Powder River Basin Oil and Gas Project are not likely to jeopardize the continued existence of the mountain plover. No critical habitat has been proposed for this species, therefore, none will be affected.

The Service has reached this conclusion by considering the following:

1. Mountain plovers are widely distributed throughout their breeding range, with the current population estimated at 10,000 individuals (USFWS 1999). The loss of relatively few individuals or nests would be a relatively minor impact on the population.
2. Habitat for the plover is present, but highly scattered throughout the project area
3. The Bureau has committed to avoidance of suitable habitat where possible and surveys for mountain plovers if avoidance of suitable habitat is not possible.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, would, kill trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity.

Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the Bureau so that they become binding conditions of any grant or permit issued, as appropriate, for the exemption in section 7(o)(2) to apply. The Bureau has a continuing duty to regulate the activity covered by this incidental take statement. If the Bureau (1) fails to assume and implement the terms and conditions or (2) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Bureau must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement. [50 CFR 402.14(i)(3)].

Sections 7(b)(4) and 7(o)(2) of the Act generally do not apply to listed plant species. However, limited protection of listed plants is provided to the extent that the Act prohibits the removal and reduction to possession of Federally listed plants, the malicious damage of endangered plants on areas under Federal jurisdiction, or the destruction of endangered plants on non-federal areas in violation of State law or regulation or in the course of any violation of a State criminal trespass law.

For the mountain plover, the prohibitions against taking the species found in section 9 of the Act do not apply until the species is listed. However, the Service advises the Bureau to consider implementing the following reasonable and prudent measures as they pertain to the mountain plover. If this conference opinion for the mountain plover is adopted as a biological opinion following a listing or designation, these measures, with their implementing terms and conditions, will be nondiscretionary.

AMOUNT OR EXTENT OF TAKE

Bald Eagle

The Service anticipates that up to four bald eagles may be killed as a result of electrocution/collision with power lines or power poles and/or killed in collisions with vehicles as the bald eagles are foraging along project roads over the 20-year life of the Powder River Basin Oil and Gas Project. Based on the Bureau's commitment to implement the conservation measures as described in the project description section of the Bureau's FBA, the Service does not anticipate a higher level of take of bald eagles over the life of the project. Additionally, proactive measures by Powder River Energy Corporation (PREC) such as a commitment that all their new power lines will be built to raptor proof guidelines, actively upgrading existing lines to raptor proof standards and providing their distribution line specifications to CBM developers in the Powder River Basin will further minimize the possibility of bald eagles being accidentally electrocuted (Mignery 2002).

The Service anticipates the loss of one additional roosting area over and above the incidental take issued for the Wyodak Coal Bed Methane Project, and Wyodak Coal Bed Methane Drainage Project. This increased level of take is a consequence of the additional disturbance associated with development and operation of the Powder River Basin Oil and Gas Project. This anticipated take is in addition to that anticipated in the biological opinions for the Wyodak Coal Bed Methane Project, and Wyodak Coal Bed Methane Drainage Project.

In our November 20, 2000, biological opinion addressing the Wyodak Coal Bed Methane Project (5,000 wells), the Service anticipated one bald eagle could be lethally taken as a result of vehicular collision and one roosting area could be lost as a consequence of increased disturbance. The Service's March 9, 2001, biological opinion addressing the Wyodak Coal Bed Methane Drainage Project (2,500 wells) anticipated an increased likelihood of take, over and above the take anticipated in the November 20, 2000, biological opinion. However, the Service did not believe the likelihood of take would increase significantly enough to warrant increasing the number of eagles or roost sites anticipated to be lost.

Given the additional disturbance associated with the Powder River Basin Oil and Gas Project (greater than five times the disturbance associated with the Wyodak Coal Bed Methane and Wyodak Coal Bed Methane Drainage Projects combined) the Service believes that the increased likelihood of take, over and above that anticipated in the above mentioned biological opinions warrants increasing the number of bald eagles anticipated to be lost. However, with three overlapping project areas, it may be difficult to discern which project actually resulted in the take. Because the required bald eagle habitat loss monitoring information was not collected for the Wyodak Coal Bed Methane and Wyodak Coal Bed Methane Drainage Projects, the Service cannot quantify the extent of take, if any, that may have of occurred during implementation and operation of these two projects.

Mountain Plover

The Service anticipates up to 2 mountain plovers (adult or chick), per year could be taken as a result of collisions with vehicles. This level of expected mortality will result from vehicular collision while the adult and chicks are foraging along roads. The likelihood of vehicle collision is highest during development but remains elevated through operation and abandonment Additionally, destruction of nests could result from vehicle traffic on an infrequent basis as mountain plovers are attracted to linear features, such as roads (Deibert 2002). Given the estimated number of new improved roads (7,135 miles) and two-tracks (10,619 miles) proposed for this project, there will likely be some direct mortality as a result of collision with vehicles. This level of take is anticipated annually, not cumulatively, over the 20 year life of the project.

Additional incidental take is expected to be in the form of indirect lethal take associated with displacement of adults from nests or broods long enough to cause take of eggs or chicks through exposure to the elements or predators, especially if people will be nearby on foot for many hours. In addition, displacement of breeding birds from known nesting areas to less suitable nesting habitat may occur due to habitat alteration and cause harm through reproductive failure. Human activity associated with project development and ongoing operation may also cause displacement and could cause take in the form of harassment. Where development increases predator abundance or efficiency, nesting plovers may be displaced to nest in less suitable habitat. The Service anticipates up to 3 percent (6,720 acres) of occupied mountain plover habitat could be

lost as a result of all actions associated with the Powder River Basin Oil and Gas Project. This level of take is anticipated to occur primarily during the development phase of this project (10 years) but covers the 20 year life of the project.

Incidental take is expected to be in the form of both direct lethal take of adult mountain plovers and their chicks, and indirect lethal take in the form of harm through modification of breeding and brooding behavior, and loss of nesting and brood rearing habitat.

The above mentioned level of indirect lethal take of this species can be anticipated by the loss of 3 percent (6,720 acres) of the occupied mountain plover habitat as a surrogate measure of take for the following reasons: the lack of current mountain plover distribution data on the analysis area; take of individuals may be difficult to detect when the species is wide-ranging; the dispersed nature of breeding birds; the small body size and cryptic nature of eggs and chicks; the rapidity with which dead or impaired specimen may be quickly removed by predators/scavengers; and difficulty of measuring increased mortality of adults, eggs or chicks as a result of increased predator abundance.

Information on the distribution and abundance of the mountain plover on the analysis area is currently inadequate to determine the actual number and density of mountain plovers that may be affected by the proposed action. Furthermore, actual site-specific details of development activities are not provided in the project description. Because the required mountain plover habitat loss monitoring information was not collected for the Wyodak Coal Bed Methane and Wyodak Coal Bed Methane Drainage Projects, the Service cannot quantify the extent of take, if any, that may have of occurred during implementation and operation of these two projects. Without information on the amount of take associated with these two projects it is difficult to estimate the level of anticipated take that may occur from implementation and operation of the Powder River Basin Oil and Gas Project. However, we do know that short term disturbance would include about 3 percent of the analysis area (DEIS. Pg. 2-10).

Of the approximately 8,000,000 acres included in the analysis area roughly 4,230,073 acres (53 percent of the analysis area) is unsuitable habitat for mountain plovers because of vegetation types that preclude mountain plover use (eg. coniferous forest, riparian mixed-grass, etc. Table

3-15, DEIS 2001). Of the remaining vegetation types (3,769,927 acres) additional areas can be eliminated from consideration as suitable habitat for mountain plovers because of vegetation height, slope or topographic features.

To estimate the amount of occupied habitat within the analysis area we used a spatially-explicit model developed by Beauvais and Smith (*In Press.*) for identifying breeding habitat for mountain plovers in western Wyoming. This model predicts the probability of the presence of breeding mountain plovers as a function of vegetation structure and slope. Although the model was developed specifically for western Wyoming, it's conclusions generally apply to eastern Wyoming as well. Thus it is currently the best way to estimate the loss of occupied mountain plover habitat associated with this project. We defined occupied habitat as all areas predicted by the model to have a probability of mountain plover presence of greater than or equal to 75 percent. Based on the Authors' experience using this model, a predicted probability value of 75 percent includes almost all occupied mountain plover habitat (Beauvais 2002). Ground truthing this model for use in the Powder River Basin the authors used a predicted probability of 80 percent in the area north of Wheatland, Wyoming, the Shirley Basin and Cyclone Rim, within the Bureau's Rawlins Field Office. When validating this model with independent data from across Wyoming the model correctly classified 87 percent of the points used in the data set (Beauvais and Smith *In Press.*). Applying this model to the Powder River Basin Oil and Gas Project area, an estimated 2.8 percent (224, 000 acres) of the analysis area is occupied mountain plover habitat. For the purpose of this Biological and Conference Opinion the Service defines occupied habitat as areas where mountain plover nesting has been confirmed by surveys conducted in accordance with the Service's Mountain plover guidelines or other Service approved techniques.

EFFECT OF THE TAKE

Bald Eagle

In the accompanying biological opinion, the Service determined that this level of anticipated take of the bald eagle is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

Mountain Plover

In the accompanying conference opinion, the Service determined that this level of anticipated take of mountain plovers is not likely to result in jeopardy to the species or destruction or adverse modification of proposed critical habitat.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures (RPM) are necessary and appropriate to minimize impacts of incidental take of bald eagles and mountain plovers.

Bald Eagle and Mountain Plover

RPM1. The Bureau shall ensure implementation of all conservation measures identified and committed to as part of the action (outlined above in Project Description and more fully described throughout the September 3, 2002, FBA).

RPM2. The Bureau shall ensure direct habitat disturbance does not exceed that discussed in the FBA and evaluated in this Biological/Conference Opinion. Through minimization and monitoring of direct habitat disturbance, indirect disturbance to the species will also be minimized.

Bald Eagle

RPM3. Reduce the possibility of vehicular collision with bald eagles, including reducing the amount of carrion present as a result of vehicular collision to discourage foraging by bald eagles.

RPM4. Reduce the possibility of electrocutions of bald eagles.

RPM5. Reduce the likelihood of disruption of nesting and roosting activities.

Mountain Plover

The following reasonable and prudent measures are designed first to avoid direct impacts to nesting mountain plovers through activity-specific nest searches, and second, to avoid or minimize impacts to known nesting aggregations by 1) avoiding or minimizing direct and indirect take of adults, eggs, or chicks on these areas, and 2) avoiding the abandonment of nesting aggregation areas.

RPM6. Minimize indirect disturbance to the species through minimization and monitoring of direct habitat disturbance.

RPM7. The Bureau shall locate nesting areas and prevent direct take and indirect take within them.

RPM8. The Bureau shall work to avoid abandonment of nesting areas.

RPM9. The Bureau shall reduce the possibility of vehicular collisions with mountain plovers.

RPM10. The Bureau shall limit project-related features that increase the population levels or hunting efficiency of predators of the mountain plover in the vicinity of known plover nest sites.

RPM11. Operators and Bureau employees shall be shown how to identify the mountain plover and provided information about its habitat requirements, natural history, status, threats, and possible impacts of gas development activities. Incidental observations of mountain plovers shall be solicited from all operator and Bureau field personnel.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the Bureau must comply with the following terms and conditions (T&C), which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are nondiscretionary.

All Species

T&C1. In the event that a bald eagle (dead or injured) or mountain plover (dead or injured) is located during construction and operation, the Service's Wyoming Field Office (307-772-2374) and the Service's Law Enforcement Office (307-261-6365) will be notified within 24 hours. The action agency must provide for monitoring the actual number of individuals taken. Because of difficulty in identification, all small birds found dead should be stored in a freezer for the Service to identify.

T&C2. The Bureau shall monitor all loss of (1) bald eagle (nesting and roosting habitat as defined in the status of the species section of his Biological and Conference Opinion) and (2) suitable mountain plover habitat associated with all actions covered under the DBA; the *Draft Statement and Draft Planning Amendment for the Powder River Basin Oil and Gas Project,* the revised FBA dated September 3, 2002, the *Final Statement for the Powder River Basin Oil and Gas Project,* and the ROD for this project. The actual measurement of habitat loss can be the responsibility of the Bureau or Bureau's agent (consultant, contractor, etc.) with a written summary provided to the Service's Wyoming Field Office semi-annually, or immediately if the Bureau determines that a site specific project proposed under the Powder River Basin Oil and Gas Project (*i.e.* Application for Permit to Drill/POD, Right-of-way grants, or Sundry Notices) will adversely affect a listed species. The tracking will include the location and acres of habitat loss, field survey reports, what stipulations were applied, and a record of any variances granted to timing and/or spatial buffers. For the purposes of this biological opinion, habitat loss is defined as the permanent or temporary alteration of habitat in such a way as to displace a species into unsuitable areas or impair/disrupt or prevent normal behavioral patterns such as breeding, feeding or sheltering. The monitoring of habitat loss for these species will commence from the date the ROD is signed. It is the responsibility of the Bureau to ensure that semi-annual reports are complete and filed with the Service in a timely manner. The semi-annual report will include field survey reports for endangered, threatened, proposed and candidate species for all actions covered under the FEIS for the Powder River Basin Oil and Gas Project and ROD. The semi-annual reports will include all actions completed under this biological and conference opinions up to 30 days prior to the reporting dates. The first report will be due 6 months after the signing of the ROD and thereafter on the anniversary dates of the signing of the ROD and 6 months after the signing of the ROD. Reporting will continue for the life of the project.

T&C3. The Bureau will initiate informal section 7 consultation with the Service when 50 percent of the allowed incidental take has occurred for either the bald eagle or the mountain plover to determine if additional measures need to be implemented to further minimize the potential for take of listed species.

T&C4. The Bureau shall require implementation of all conservation measures/mitigation measures for all species identified in the revised FBA prepared for the project and dated September 3, 2002, the FEIS for the Powder River Basin Oil and Gas Project, and the ROD. These measures are identified in the DESCRIPTION OF PROPOSED ACTION section of this Biological and Conference Opinion.

T&C5. The Bureau shall monitor for compliance with all Terms and Conditions.

Bald Eagle

T&C6. Power lines will be built to standards identified by the Avian Power Line Interaction Committee (1996) to minimize electrocution potential. Moreover, power lines will be built according to the additional specifications listed below. The Bureau will ensure that these additional standards to minimize bald eagle mortalities associated with utility transmission lines, will be incorporated into the stipulations for all project actions (*i.e.* Application for Permit to Drill/POD, Right-of-way grants, or Sundry Notices). It should be noted that these measures vary in their effectiveness to minimize mortality, and may be modified as they are tested in the field and laboratory. Local habitat conditions should be considered in their use. The Service does not endorse any specific product that can be used to prevent and/or minimize mortality, however, we are providing a list of *Major Manufacturers of Products to Reduce Animal Interactions on Electrical Utility Facilities.* The following represents areas where bald eagle protection measures will be applied when designing/constructing new distribution lines or modifying existing facilities:

For new distribution lines and facilities:

A. Bury distribution lines where feasible.
B. Raptor-safe structures (e.g., with increased conductor-conductor spacing) are to be used that provide adequate spacing for bald eagles (i.e. minimum 60" for bald eagles).
C. Equipment installations (overhead service transformers, capacitors, reclosers, etc.) are to be made bald eagle safe (e.g., by insulating the bushing conductor terminations and by using covered jumper conductors).
D. Jumper conductor installations (e.g. corner, tap structures, etc.) are to be made bald eagle safe by using covered jumpers or providing adequate separation.
E. Employ covers for arrestors and cutouts, when necessary.
F. Lines should avoid high avian use areas such as wetlands, prairie dog towns, and grouse leks.

For modification of existing facilities:

A. Existing structures, such as dead ends, tap or junction poles, transformers, reclosers and capacitor banks or other structures with less than 60" between conductors or a conductor and ground will need to be retrofitted to provide adequate spacing for bald eagles (i.e. minimum 60" for bald eagles).
B. Cover exposed jumpers
C. Gap any pole top ground wires
D. Isolate grounded guy wires (install insulating link)
E. On transformers, install insulated bushing covers, covered jumpers, and cutout covers and arrestor covers, if necessary
F. If bald eagle mortalities occur on existing lines and structures, bald eagle protection measures are to be applied (e.g. modify for raptor-safe construction, install safe perches or perching deterrents, nesting platforms or nest deterrent devices, etc.)
G. In areas where midspan collisions are a problem, install line-marking devices that have been proven effective. All transmission lines that span streams and rivers, should maintain proper spacing and have markers installed.

T&C7. A minimum year-round disturbance-free buffer zone (no surface occupancy (NSO)) of 0.5 mile will be established for all bald eagle nests. An alternative would be development of a site management plan, as discussed in the *GYBEWG* and the *MBEWG*, by the Bureau (with the cooperation and approval of the Service) for each bald eagle nest or winter roost site. Each site management plan will include the following zones: Zone 1 (Occupational Nesting Zone), Zone 2 (Primary use areas), and Zones 3 (home ranges). The Bureau will restrict and monitor the types of activities to occur within each of these zones. No surface occupancy or use is allowed within 0.5 miles of known bald eagle nest sites which have been active within the past 5 years.

T&C8. A seasonal disturbance-free buffer zone of 1 mile will be established for all bald eagle nests (February 15 - August 15). This buffer zone and timing may be adjusted based on site specific information through coordination with and with written concurrence of the Service's Wyoming Field Office.

T&C9. A year-round disturbance-free buffer zone of 0.5 mile will be established for all bald eagle roost sites. This buffer zone restriction may be adjusted based on site specific information through coordination with and with written concurrence of the Service's Wyoming Field Office.

T&C10. An additional seasonal buffer zone of 0.5 mile will be established for all bald eagle roost sites (November 1 - April 1). This buffer zone will start at the outside boundary of the 0.5 mile year-round disturbance-free buffer zone and extend out an additional 0.5 mile. However, within this seasonal buffer zone less restrictive measures such as remote monitoring of wells and/or restricting well maintenance visitations or human activity critical to project operations to between 9:00 AM and 3:00 PM may be allowed after coordination with the Service's Wyoming Field Office and a demonstration that measures more protective of bald eagles are not reasonable or feasible.

T&C11. Nest productivity monitoring will be conducted by the Bureau or a Bureau-approved biologist in areas with high levels of development (i.e., areas with greater than or equal to 4 well pads/section) within 1 mile of a bald eagle nest between March 1 and mid-July to determine nesting success (i.e., number of nestlings/fledglings per nest).

T&C12. Appropriately-timed surveys for active bald eagle nests and winter roost sites will be conducted within 1 mile of proposed actions prior to permit (*i.e.* Application for Permit to Drill/POD, Right-of-way grants, or Sundry Notices) approval.

Mountain Plover

T&C13. A seasonal disturbance-free buffer zone of 0.25 mile will be maintained around all active mountain plover nest sites outside of black-tailed prairie dog towns between March 15 and July 31.

T&C14. Disturbance to prairie dog towns will be avoided where possible. Mountain plover nests on prairie dog towns will have a year-round disturbance-free buffer zone of 0.25 mile once nesting has been confirmed. An exception may be granted by the authorized officer only after the Bureau consults with the Service's Wyoming Field Office on a case by case basis and the operator agrees to adhere to any new operational constraints recommended by the Service.

T&C15. Habitat suitability surveys will be conducted by a Bureau biologist or Bureau approved biologist prior to permit (*i.e.* Application for Permit to Drill/POD, Right-of-way grants, or Sundry Notices) approval.

T&C16. Surveys for nesting mountain plovers will be conducted by a Bureau biologist or Bureau approved biologist if ground disturbing activities are anticipated to occur in suitable habitat between April 10 and July 10. The earlier date will facilitate detection of early-breeding plovers. Surveys will follow the most current version of the Service's Mountain Plover Survey Guidelines (USFWS 2002 or most current version).

T&C17. Roads will be located outside of nesting plover habitat wherever possible. Maximum allowed travel speed on roads within 0.5 mile of identified mountain plover nesting areas shall not exceed 25 miles per hour from March 15 to July 31.

T&C18. Creation of raptor hunting perches will be avoided within 0.5-mile of identified nesting areas. Where artificial hunting perches are created within 0.5-mile of identified nesting areas perch inhibitors will be installed to deter avian predators from preying on mountain plovers and nests.

T&C19. Native seed mixes will be used to re-establish short grass prairie vegetation during reclamation.

T&C20. No ground-disturbing activities shall occur in suitable nesting habitat prior to surveys conducted in compliance with the Service's 2002 Mountain Plover Survey Guidelines (attached) regardless of the timing of the disturbance. Once occupied mountain plover nesting habitat is located, the Bureau shall reinitiate section 7 consultation with the Service on any project-related activities proposed for such habitat or within 0.25-mile of such habitat. The amount and nature of ground-disturbing activities shall be limited within and adjacent to identified nesting areas in a manner to avoid the abandonment of these areas.

T&C21. There will be No Surface Occupancy (NSO) of ancillary facilities (e.g. compressor stations, processing plants, etc.) within 0.5 mile of known nesting areas. Variance may be granted only after consultation with and agreement of the Service.

T&C22. Work schedules and shift changes should be set to avoid the periods from one-half hour before to one-half hour after sunrise and sunset during June and July, when mountain plovers and other wildlife are most active.

T&C23. No dogs will be permitted at work sites to reduce the potential for harassment of plovers.

T&C24. The Service will provide the Bureau and operators with educational material illustrating and describing the mountain plover, its habitat needs, life history, threats, and gas development activities that may lead to incidental take of eggs, chicks, or adults. The Bureau and operators shall ensure these material are posted in common areas and circulated in a memorandum among all employees and service providers.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Bureau must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

Note: Incidental take coverage for the mountain plover does not occur until the mountain plover is listed as a threatened species. The mountain plover is currently protected by the Migratory Bird Treaty Act. Therefore, take of this migratory bird is prohibited, **the issuance of this conference opinion notwithstanding.**

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations (CR) are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

CR1. Develop programmatic standards and guidelines to be incorporated into Land Use Plan amendments or revisions for all future actions related to oil and gas development. Conservation measures should apply to all phases of oil and gas development, including operations and maintenance activities.

CR2. To improve bald eagle nesting and roosting habitat cottonwood regeneration should be encouraged within the project area through reduction, modification and/or removal of domestic grazing, recreational use, or mineral extraction, if those activities are identified as being a cause of lack of regeneration.

CR3. Road-killed animals (excluding migratory birds) should be promptly removed from areas within 0.5-mile of identified mountain plover nesting areas. Removing carrion from or near roads as soon as possible would minimize the possibility of vehicular collision with bald eagles foraging on or near roads and to avoid attracting avian and mammalian predators of mountain plover.

CR4. Surveys of the entire project area should be conducted for mountain plovers (both nesting and brood rearing activities) to provide an estimate of population numbers in the area and availability of suitable habitat, and impacts of CBM development on this species.

CR5. Conduct research to better understand the effects of oil and gas development on breeding mountain plovers. The focus of research should be to measure recruitment to the fall population, philopatry, and site fidelity between developed and undeveloped mountain plover breeding concentration areas on or near the project area. This effort would require close monitoring of a large sample of breeding adults, and possibly color-marking or radio-marking adults and juveniles.

CR6. Mountain plover display high site fidelity and their long term absence from an area may preclude natural re-occupation of suitable habitat. If long term monitoring does not document any significant numbers of mountain plover in suitable habitat in the project area, translocate young mountain plover to unoccupied habitat to attempt re-establishment of local populations. Monitor marked birds to determine success of translocation.

CR7. Surveys of all suitable habitat within the project area and all adjacent drainages should be conducted for Ute ladies'-tresses to determine the status and distribution of this species in the general vicinity.

CR8. Re-establish prairie dog colonies in reclaimed or suitable habitat for nesting mountain plovers by translocating prairie dogs from occupied colonies within the area.

CR9. Utilize remote monitoring technology to reduce site visits to well pads and ancillary facilities thereby, reducing wildlife disturbances and mortalities.

Field Manager, Buffalo Field Office, Bureau of Land Management

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation and conferencing on the actions outlined in the December 2001, Assessment and September 3, 2002, FBA regarding the Powder River Basin Oil and Gas Project in Campbell, Converse, Johnson, and Sheridan counties, Wyoming. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

You may ask the Service to confirm the conference opinion as a biological opinion issued through formal consultation if the mountain plover is listed. The request must be in writing. If the Service reviews the proposed action and finds that there have been no significant changes in the action as planned or in the information used during the conference, the Service will confirm the conference opinion as the biological opinion on the project and no further section 7 consultation will be necessary.

After listing of the mountain plover as endangered or threatened and any subsequent adoption of this conference opinion, the Bureau shall request reinitiation of consultation if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect the species or critical habitat in a manner or to an extent not considered in this conference opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the species or critical habitat that was not considered in this conference opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

The portion of the incidental take statement addressing the mountain plover provided in this conference opinion does not become effective until the species is listed and the conference opinion is adopted as the biological opinion issued through formal consultation. At that time, the project will be reviewed to determine whether any take of the mountain plover has occurred. Modifications of the opinion and incidental take statement may be appropriate to reflect that take. No take of the mountain plover may occur between the listing of the mountain plover and the adoption of the conference opinion through formal consultation, or the completion of a subsequent formal consultation.

Field Manager, Buffalo Field Office, Bureau of Land Management

Thank you for your assistance in the conservation of endangered, threatened, and proposed species. If you have any questions or comments on this biological opinion or your responsibilities under the Act, please contact Bradley Rogers at the letterhead address or by phone at (307) 772-2374, extension 25. In your response, please refer to (W.02/WY6633(ES-6-WY-02-F006).

Attachments (2)

cc: Statewide Habitat Coordinator, WGFD, Cheyenne, WY
Non-game Coordinator, WGFD, Lander, WY
J. Levin, State Of Wyoming, Cheyenne, WY
Bureau of Land Management, Cheyenne, WY
Susan Linner, R6 Regional Office, FWS, Denver, CO
Field Supervisor, FWS, Helena, MT

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MOUNTAIN PLOVER SURVEY GUIDELINES
U.S. Fish and Wildlife Service
March 2002

The mountain plover (*Charadrius montanus*) is a small bird (17.5 cm, 7 in.) about the size of a killdeer (*C. vociferus*). It is light brown above with a lighter colored breast, but lacks the contrasting dark breast-belt common to many other plovers. During the breeding season it has a white forehead and a dark line between the beak and eye, which contrasts with the dark crown.
Mountain plover breeding habitat includes short-grass prairie and shrub-steppe landscapes; dryland, cultivated farms; and prairie dog towns. Plovers usually nest on sites where vegetation is sparse or absent, conditions that can be created by herbivores, including domestic livestock and prairie dogs. Vegetation in shortgrass prairie sites is typically less than 4 inches tall. Nest sites within the shrub-steppe landscape are also confined to areas of little to no vegetation, although surrounded by areas visually dominated by shrubs. Commonly, nest sites within shrub-steppe areas are on active prairie dog towns. Nests are commonly located near a manure pile or rock. In addition to disturbance by prairie dogs or livestock, nests have also been found on bare ground created by oil and gas development activities, and on dryland, cultivated agriculture in the southern part of their breeding range. Mountain plovers are rarely found near water. Positive indicators for mountain plovers therefore include level terrain, prairie dogs, bare ground, *Opuntia* pads, cattle, widely spaced plants, and horned larks. It would be unusual to find mountain plovers on sites characterized by irregular or rolling terrain; dense, matted vegetation; grass taller than 4 inches, wet soils, or the presence of killdeer.

These guidelines were developed by Service biologists and Dr. Fritz Knopf, USGS-BRD. Keep in mind these are guidelines - please call the local Fish and Wildlife Service, Ecological Services office, if you have any suggestions.

GENERAL GUIDELINES FOR SURVEYS

On February 16, 1999, the Service proposed the mountain plover for federal listing as threatened. Because listing of this species is proposed, the Service may recommend surveys for mountain plovers to better define nesting areas, and minimize potential negative impacts. The Service may recommend surveys for mountain plovers in all suitable habitat, as well as avoidance of nesting areas, to minimize impact to plovers in a site planned for development. While the Service believes that plover surveys, avoidance of nesting and brood rearing areas, and timing restrictions (avoidance of important areas during nesting) will lessen the chance of direct impacts to and mortality of individual mountain plovers in the area, these restrictions do nothing to mitigate indirect effects, including changes in habitat suitability and habitat loss. Surveys are, however, a necessary starting point. The Service has developed the following 3 survey guidelines, depending on whether the intent is to determine the presence or absence of plovers at a site during the nesting season for permanent and short term projects, or to determine the density of nesting plovers at known nesting sites.

Survey Protocol

Surveys for mountain plovers are conducted during the period where the highest numbers of plovers are likely to be tending nests and territories, and therefore are most likely to be detected. Throughout their range, these dates are generally from May 01 through June 15. However, seasonal restrictions for ground disturbing activities in suitable mountain plover nesting habitats are usually longer than the survey dates. The longer seasonal restrictions allow for protection of early nesting birds, and very young chicks which tend to sit still to avoid detection during the first week post-hatch. Since specific nesting dates across the breeding range of the plover vary according to latitude and local weather, the project proponent or the land management agency should contact the local U.S. Fish and Wildlife Service Office to determine what seasonal restrictions apply for specific projects.

Two types of surveys may be conducted: 1) surveys to determine the presence/absence of breeding plovers (i.e., displaying males and foraging adults), or 2) surveys to determine nest density. The survey type chosen for a project and the extent of the survey area (i.e., beyond the edge of the construction or operational ROW) will depend on the type of project activity being analyzed (e.g., construction, operation) and the users intent. One methodology outlines a breeding survey that was used in northeastern Colorado to establish the density of occupied territories, based on displaying male plovers or foraging adults. The other was developed to only determine whether plovers occupy an area.

Techniques Common to Each Survey Method

ï Conduct surveys during early courtship and territorial establishment. Throughout the breeding range, this period extends from approximately mid-April through early July. However, the specific breeding period, and therefore peak survey days, depends on latitude, elevation, and weather.

ï Conduct surveys between local sunrise and 1000 and from 1730 to sunset (periods of horizontal light to facilitate spotting the white breast of the adult plovers).

ï Drive transects within the project area to minimize early flushing. Flushing distances for mountain plovers may be within 3 meters for vehicles, but plovers often flush at 50 to 100 meters when approached by humans on foot.

ï Use of a 4-wheel drive vehicle is preferable where allowed. Use of ATVs has proven highly successful in observing and recording displaying males.

Always seek guidance from land management agencies regarding use of vehicles on public lands, and always obtain permission of private landowners before entering their lands.

ï Stay in or close to the vehicle when scanning. Use binoculars to scan and spotting scopes to confirm sightings. Do not use scopes to scan.

ï Do not conduct surveys in poor weather (i.e., high wind, precipitation, etc.).

ï Surveys conducted during the courtship period should focus on identifying displaying or calling males, which would signify breeding territories.

ï For all breeding birds observed, conduct additional surveys immediately prior to construction activities to search for active nest sites.

ï If an active nest is located, an appropriate buffer area should be established to prevent direct loss of the nest or indirect impacts from human-related disturbance. The appropriate buffer distance will vary, depending on topography, type of activity proposed, and duration of disturbance. For disturbances including pedestrian foot traffic and continual equipment operations, a 1/4 mile buffer is recommended.

SURVEY TO DETERMINE PRESENCE/ABSENCE

Large scale/long term projects

1. Conduct the survey between May 1 and June 15, throughout the breeding range.

2. Visual observation of the area should be made within 1/4 mile of the proposed action to detect the presence of plovers. All plovers located should be observed long enough to determine if a nest is present. These observations should be made from within a stationary vehicle, as plovers do not appear to be wary of vehicles. Because this survey is to determine presence/absence only, and not calculate statistical confidence, there is no recommended distance interval for stopping the vehicle to scan for birds. Obviously numerous stops will be required to conduct a thorough survey, but number of stops should be determined on a project and site-specific basis.

3. If no visual observations are made from vehicles, the area should be surveyed on ATVís. Extreme care should be exercised in locating plovers due to their highly secretive and quiet nature. Surveys by foot are not recommended because plovers tend to flush at greater distances when

approached using this method. Finding nests during foot surveys is more difficult because of the greater flushing distance.

4. A site must be surveyed 3 times during the survey window, with each survey separated by at least 14 days. The need for 3 surveys is to capture the entire nesting period, with the intent of reducing the risk of concluding the site is not nesting habitat by an absence of nesting birds during a single survey.

5. Initiation of the project should occur as near to completion of the survey as possible. For example, seismic exploration should begin within 2 days of survey completion. A 14 day period may be appropriate for other projects.

6. If an active nest is found in the survey area, the planned activity should be delayed 37 days, or seven days post-hatching. If a brood of flightless chicks is observed, activities should be delayed at least seven days.

Short-term, linear projects

The Service recognizes that many projects have minimal, if any impact on mountain plover nesting habitat, and that these projects may only be present in suitable habitat for a day or less. In order to address concerns from project proponents about delays associated with mountain plover surveys for these projects, the Service has developed the following guidelines. However, the Service encourages the project proponent to plan these projects so that all work occurs outside the plover nesting season.

Short-term linear projects are defined as projects which move through an area within the course of a day and result in no permanent habitat alteration (e.g., vegetative/topographic changes), and no permanent project-related above ground features. Short-term, linear projects may include activities such as pipelines (4 inch diameter or less), fiber optic cables, and seismic exploration. For these projects, all ROW surveying/staking activities should be completed before April 1 to avoid discouraging plovers from nesting in suitable habitat. If ROW surveying cannot be completed before April 1, surveyors will need to coordinate with the lead Federal agency before entering these areas, and a plover survey may be required prior to ROW demarcation. For these projects, the presence/absence guidelines above should adhere to the dates below.

1. **April 10 through July 10 -** a plover survey will need to be completed 1- 3 days prior to any construction activity, including initial brush clearing, to avoid direct take of mountain plovers. The survey should include the route and a 1/4 mile buffer on either of the project corridor. If there is a break in construction activity in these areas of more than 3 days (e.g., between pipe stringing, trenching, or welding), an additional plover survey is necessary before construction activity can resume after that break in

activity. Generally, mountain plovers are either establishing territories and nests in April, and from late June to early July young chicks commonly freeze in place to avoid detection, increasing their vulnerability to direct take. After July 10, most mountain plover chicks are sufficiently mobile to reduce the risk of direct take.

2. If an active nest is found in the survey area, the planned activity should be delayed 37 days, or seven days post-hatching. If a brood of flightless chicks is observed, activities should be delayed at least seven days.

SURVEY TO DETERMINE DENSITY OF NESTING MOUNTAIN PLOVERS

We are assuming people will have received training on point counts in general before using this specialized point count technique adapted to mountain plovers.

Establishing Transects

1. Identify appropriate habitat and habitat of interest within geographic areas of interest.

2. Upon arriving in appropriate habitat, drive to a previously determined random starting point.

3. For subsequent points, drive a previously determined random distance of 0.3, 0.4 or 0.5 miles.

4. Each transect of point counts should contain a minimum of 20 points.

Conducting The Point Counts

1. Conduct counts between last week in June to July 4th at elevations equivalent to the eastern plains of Colorado (i.e., about 5,000 feet). Timing of counts at other elevations should be coordinated with the local FWS office.

2. Only 1 counter is used. Do not use a counter and recorder or other combinations of field help. Drivers are okay as long as they don't help spot plovers.

3. If an adult mountain plover is observed, plot occupied territories on a minimum of 1:24,000 scale map and on a ROW diagram or site grid (see attached). The ROW diagram will be at a greater level of detail, depicting the location of breeding birds (and possible nest sites) relative to ROW centerline, construction boundary, and applicable access roads.

4. Estimate or measure distances (in meters) to all mountain plovers. Method used should be noted, e.g., estimates w/distance training, estimates w/o distance training, rangefinder or measured with tape measure, etc.

5. Record "fly-overs" as "FO" in the distance column of the data sheet.

6. If you disturb a mountain plover while approaching the point, estimate the distance from point-center to the spot from which the bird was flushed.

7. Conduct counts for 5 minutes with a 3 minute subsample to standardize with BBS.

8. Stay close to your vehicle while scanning.

Recording Data

Record the following information AT EVERY POINT, EVERY DAY.

- start time
- unique point code (don't duplicate within a field crew or across dates)
- number of mountain plovers and distance to each
- land use and/or habitat type (e.g., fallow wheat, plowed, shortgrass)
- temperature, Beaufort wind, and sky conditions (clear, partly cloudy, overcast)
- Information on the data sheet somewhere.
- your name and address
- date
- Record for each point at some point during the census.
- detailed location description of each point count including road number, distance to important intersections.
- record transect and point locations on USGS county maps.
- Universal Transverse Mercator from maps or GPS are useful.

GENERAL HABITAT INDICATORS

Positive habitat images

Stock tank (non-leaking, leaking tanks often attract killdeer)

Flat (level or ìtiltedî) terrain

Burned field/prairie/pasture

Bare ground (minimum of 30 percent)

ìSpacedî grass plants

Prairie dog colonies

Horned larks

Cattle

Heavily grazed pastures

Opuntia pads visible

Negative habitat images

Killdeer present (indicating less than optimal habitat)

Hillsides or steep slope

Prominent, obvious low ridge

Leaky stock tanks

Vegetation greater than 4 inches in height in short-grass prairie habitat

Increasing presence of tall shrubs

Matted grass (i.e., minimal bare ground)

Lark buntings

Appendix L
Human Remains Plan

Appendix L — Human Remains Plan for the Powder River Basin Oil and Gas Project

Upon the discovery of suspected human remains the following procedures will be implemented. Should archaeological techniques need to be employed at any stage of these procedures these must meet all applicable professional standards and be documented in a report or reports that are acceptable to the Bureau and the SHPO.

Discovery Notification

Whenever any person discovers human remains on BLM land that may be Native American, the law requires the individual to immediately notify the BLM of such discovery. The staff archaeologist and field manager may be notified verbally, but the person who knows of the discovery must also make written notification. This will be done within 24 hours of the discovery. Upon notification of the discovery, BLM will take the following steps: (1) Notify the appropriate law enforcement authorities, the coroner and BLM's NAGPRA Coordinator, (2) take immediate further steps to protect the discovery; (3) Determine that indeed the discovery is on BLM lands that the discovery is likely Native American and (4) initiate consultation with the appropriate tribal authorities.

Protecting the Remains

If the discovery occurs in connection with an authorized use, the activity that caused the discovery is to immediately cease and the materials are to be protected until the BLM can respond to the situation. Steps must be taken to secure and protect the remains. Appropriate measures may include posting a guard and/or covering the area with a tarp in adverse weather conditions. In all instances the goal is to prevent deterioration of or further damage to the remains and the area associated with those remains.

Notification to Law Enforcement

The BLM will notify appropriate law enforcement agencies and the SHPO. Law enforcement personnel must be afforded priority to the discovery and determine if they feel criminal investigation is needed or warranted, i.e. the discovery represents a crime scene. Until law enforcement formally releases the scene the discovery location shall be considered a crime scene under the direct supervision of law enforcement personnel. The BLM staff archaeologist can advise law enforcement personnel regarding protection measures and information collection techniques. Upon notification that law enforcement has no further interest in the matter the following procedures are implemented.

Assessment of the Remains

A. BLM will first assess if it does indeed have human remains present. If the coroner or a forensic specialist has been involved in the project as per Step 3 above, it is likely that a determination of sex, race and approximate age of the human remains will have been made. Absent this information the BLM will take appropriate steps necessary to retrieve this basic information. The intent here is to provide information necessary to assess the nature of the remains in a non- destructive fashion.

B. Should the remains be determined through the evidence available to not include Native American skeletal elements, disposition of the remains shall be determined by the BLM in consultation with the SHPO and potential relatives descendants.

C. Should the remains be determined to include Native American skeletal materials then the BLM will comply with the Native American Graves Protection and Repatriation Act (NAGPRA). The Field Office will notify the BLM Deputy Preservation Officer to assist the Field Office in determining which tribe(s) should be notified of the discovery and determine notification procedures. Appropriate tribal officials should be provided an opportunity to visit the discovery site.

Written Action Plan

Subsequent to Native American Consultation, any further efforts directed at protecting the discovery in situ, removing the remains from the site and/or repatriating the remains to tribal authorities will be done in accordance with a written Action Plan. This plan will be prepared or approved by BLM, in consultation with SHPO, and follow procedures and standards established by BLM in compliance with NAGPRA.

Disposition of the Remains

The BLM is responsible for the security of the materials until they are transferred to a tribe. Once transfer has occurred, neither BLM nor any other Federal entity or its agents are responsible for the material. If the tribe wishes to have the materials curated, the tribe is responsible for entering into any agreements that may be required by the curatorial facility.

Resumption of Activity

Work at the scene may not resume without expressed written permission of the Field Office Manager. This permission can only be given after the a written, binding agreement is executed between the necessary parties that adopts a recovery plan for removal, treatment, and disposition of the human remains or cultural items in accordance with 43 CFR Part 10.4(e).

Decision Record

While a transfer of material may or may not take place, in all cases, a formal decision must be prepared. The preparation of the decision record and all tribal consultation should be formally documented and retained in the project file by the authorizing field office in cases where transfer does not occur and retained in the BLM State Office in cases where transfer does occur.

Appendix M
Programmatic Mitigation Plan

PROGRAMMATIC MITIGATION PLAN

The following mitigation measures have been carried forward from the Wyodak EIS and the Wyodak Drainage EA . Any new mitigation resulting from analysis in this EIS will be disclosed in the Record of Decision and will be added or will replace or revise the mitigation measures already identified in this plan. Project design features that will be required, if applicable site-specifically, at the APD/POD level of analysis are compiled below as a programmatic mitigation plan for CBM development. Mitigation measures also are described in various sections of chapter 4 of the FEIS, where they are incorporated within the resource impact analyses. Requirements that are standard conditions of approval for CBM APD)s are described in Appendix C. The Buffalo Field Office's *Coalbed Methane Well Application for Permit to Drill and Project Plan of Development Preparation Guide*is also used as a guide to avoid or minimize environmental harm.

These mitigation measures can be applied by BLM as *Conditions of Approval* (COAs) at the ADP/POD approval stage and will be in addition to stipulations applied at the time of lease issuance. Additional site-specific COAs, identified during site specific NEPA analysis may also be applied at the APD/POD approval stage.

Geology and Minerals

Inadvertent release to the atmosphere of the methane resource will be controlled through WOGCC requirements and APD conditions of approval that address well control, casing, ventilation, and plugging procedures appropriate to site-specific CBM development plans.

Surface Water

A water management plan must accompany each federal APD/POD and must address all potential CBM development in a watershed area, regardless of surface and mineral ownership. Development of water management plans are the responsibility of the operators. These plans will be developed on a site-specific basis or on a project-level basis. The BLM and Forest Service, have primary oversight for these plans related to federal leases. The Corps of Engineers, Wyoming State Engineer's Office, WOGCC and/or WDEQ) also may have involvment along with conservation districts. Operators, landowners, and nearby downstream interests (including water users and landowners affected by impacts of increased flows on access, ranching, or mining operations) will also be involved. Cooperation between all stakeholders will be necessary in order to develop water management plans that identify mitigating measures for areas or drainages where high CBM-generated flows are or could be impacting existing uses. Some of the measures that could be applied, as appropriate, at each site include:

- Produced water will be dispersed in the upper reaches of drainages by installing stock tanks.
- Produced water will be transported to distant discharge points when required to avoid sensitive soils, agricultural areas that could be harmed, or areas of potential accelerated erosion.
- Produced water will be discharged into existing stream channels, reservoirs, stock ponds, and stock tanks in a manner that will not cause accelerated erosion. This has been done effectively in past CBM projects by using energy dissipaters at discharge points and by discharging into channels that are well developed and large enough to handle the

increased flows. Energy dissipation can be achieved by using rock, concrete control structures, or hydrophytic (water-loving) vegetation.

- Discharge points will be located to minimize spring flooding in fields and in accordance with surface owner agreements.
- Discharge outfalls will use alternative outfalls for use with irrigation, as agreed by the operator and landowner or lessee. If discharge water SAR values are not in compliance with WDEQ irrigation suitability evaluation criteria, water discharge on irrigated lands will be prohibited unless the operator treats the water to meet the criteria before discharging it, or confines the untreated water in compliant impoundment(s).

Treatment options that could be used and have been explored to reduce SAR levels include:

1. Off channel complete containment in evaporation/infiltration ponds.
2. On channel storage and dilution ponds, where dilution with the natural runoff will meet acceptable SAR values upon a discharge.
3. Ion exchange units.
4. Re-injection into potable and nonpotable aquifers if receivers are available to accept the water.
5. Infiltration leach fields.

- In those situations where treatment for barium would be necessary before WDEQ would issue a NPDES permit, the following treatment methods could be used:
    1. Allow the water to come in contact with soils, stream channels, and/or naturally occurring surface water.
    2. WDEQ requires BMPs at the wellhead to remove soluble iron. These aeration devices and small treatment ponds also work well to remove barium.
    3. CBM waters containing elevated barium (800 to 2,000 ug/l range) may be discharged into stream channels immediately above a storage reservoir (CBM Associates 2001).
- To handle total flows with the addition of CBM produced waters, existing downstream culverts on lease will be replaced if flows exceed culvert capacity. New culverts and/or low water crossings will need to be sized to BLM standards for anticipated total flows. Off lease, it is recommended that the operator work with other operators and with surface owners in the same drainage to replace downstream undersized culverts that will be affected by their discharge.
- Discharges will be limited to a volume less than or equal to the naturally occurring mean annual peak flow (which is roughly equivalent to a peak generated by a 2-year, 24-hour storm) and that can be handled by the natural channel under anticipated conditions.

- Local springs will be identified, and construction in the areas will be avoided.
- Potential impacts to spring flow, specifically those related to scoria aquifers like the one feeding Moyer Springs, will be analyzed site-specifically, as needed, during review of APDs/PODs or sundry notices. Impacts will be mitigated by applying special conditions of approval for drilling or production operations.
- Discharge into playas will be avoided unless issues related to potential wetland creation, maintenance of discharge facilities, reclamation, and accountability are agreed to by the operator and landowner or lessee.
- Design and siting of discharge facilities must be avoided, carefully controlled, or limited where channels are not stable, armored, or large enough to accommodate the flows that will be anticipated.
- Design and location of discharge points must be carefully controlled or limited to ensure that localized flooding does not occur where channel or basin capacity is insufficient to handle increased flows.
- Discharge points will be selected in stable channels or reservoirs away from any significant downstream headcuts or other major erosional features. Outfall design may include discharge aprons and downstream stabilization of channel side slopes to prevent erosion and provide energy dissipation.
- Discharge facilities will be site-specifically designed using best management practices, to accommodate livestock access to water, to control erosion, and to limit sedimentation.
- Irrigation diversions and in-stream impoundments will be established, as appropriate, and as agreed to by the operator and landowner or lessee. Downstream impoundments may need new or redesigned outlet works in order to handle the steady inflow provided by CBM discharge water.
- The areal extent of surface disturbance and the length of time that the area will remain disturbed before interim or final reclamation activities commence will be minimized.
- Interim and final reclamation of all disturbed areas will proceed in a timely manner. Reclamation activities will be conducted during timeframes established by federal land management agencies, landowners, and affected interests.
- Reclamation must produce a natural appearance and must be consistent with site conditions, area management standards, and projected uses, as agreed to by the operator, landowner or lessee, and appropriate state and federal agencies.
- Reclamation will include, as appropriate, recontouring, establishing desirable, perennial vegetation, and stabilizing and controlling erosion of all disturbed areas. Additional measures, such as topsoil conservation, temporary fencing, mulching, or weed control will be used as necessary to ensure long-term vegetative stabilization of all disturbed areas. Reclamation standards will be agreed to between the operator, landowner or lessee, and appropriate state and federal agencies.

- At the discretion of the surface owner, dams will be removed and the impoundment area reclaimed after the produced water is no longer available.
- Timely recontouring and revegetation of disturbed areas will be required to limit runoff from disturbed areas that could cause sediment concentrations in surface waters to rise over pre-disturbance levels.

Groundwater

- A standard agreement has been developed by CBM operators and landowners to monitor and mitigate water well impacts caused by CBM operations.

Air Quality

Air quality issues related to stationary sources of air pollution will be addressed in accordance with the authorities of the WDEQ. Air quality issues related to mobile sources of air pollution will be addressed in accordance with the authorities of the EPA. Visibility impairment within federally mandated Class I areas will be addressed in accordance with federal regulations on regional haze. Visibility impairment at other Class I and sensitive Class II areas will be addressed in accordance with the recommendations from interagency and stakeholder coordinating groups.

At the discretion of the surface owner, and in accordance with permitting decisions made by the WDEQ, compressors and compressor stations should be sited to avoid sensitive surface resources and potential conflicts with other uses.

Under the regulatory authority of the WDEQ and at the discretion of the landowner and the CBM operator, the implementation cost and effectiveness of electrification of compressors and other BACT will be considered.

Soils

Areas of highly erosive soils will be avoided when drill sites, two-track access routes, and pipeline routes are surveyed and staked in order to substantially reduce the amount of soil loss.

Wetlands

For any jurisdictional wetlands identified that may be impacted, a detailed mitigation plan will be developed during the APD/POD or sundry notice approval process. Federal requirements to replace all impacted wetlands will mitigate this loss, so environmental impacts will occur only during the life of the project (including reclamation).

To reduce adverse effects on existing wetlands, water discharge should not be allowed if increased discharge volumes or subsequent recharge of shallow aquifers will inundate and kill woody species, such as willows or cottonwoods.

- Discharge into playas and will be avoided unless issues related to potential wetland creation, maintenance of discharge facilities, reclamation, and accountability are agreed to by the operator and landowner or lessee. If discharge is allowed at the discretion of the surface owner, fencing wetlands and providing off-site watering for livestock will be used to allow vegetation to develop and to maintain water quality in key wetlands. Any fences used should be placed well back from the wetlands to prevent waterfowl mortalities and should be constructed to standards that allow big game movement.

Wildlife

Power line corridors will avoid wetlands, to the extent possible, in order to reduce the chance of waterfowl hitting the lines.

Cultural Resources

A cultural inventory will be conducted on all areas of proposed surface disturbance at the APD/POD or sundry notice phase of each action.

Specific plans for avoidance or data recovery will be recommended for any significant sites within the area of potential effect of the proposed activities.

Land Use and Transportation

If CBM development activities are proposed in the vicinity of scattered subdivisions near Gillette, site-specific mitigating measures will be developed to minimize the impacts and to resolve conflicts.

Over the project life, uneconomic and depleted wells will be plugged and abandoned, and the disturbance reclaimed and revegetated to approximate pre-project conditions.

CBM facilities such as central gathering and metering facilities or compression facilities will be fenced as specified by the BLM.

Roads and facilities no longer needed will be removed and the affected area will be rehabilitated.

Where feasible, gas and water pipelines and electrical cables will be installed in the access road corridor.

Visual Resources

Long-term visual impacts will be minimized by designing permanent structures so that they blend with the surrounding landscape to the extent feasible. Disturbed areas no longer needed for operations will be recontoured and revegetated as soon as practicable, and straight edges made by roads, pipelines, well pads, and compression facilities will be reshaped to create irregular or indistinct edges.

Proposed facility developments on BLM-administered federal surface will be consistent with BLM management objectives for mapped VRM classes.

All proposed wells and facilities on FS-administered federal surface will be consistent with visual quality objectives for the Thunder Basin National Grassland. Adverse impacts will be minimized by locating facilities, minimizing disturbance of affected sites, and by designing facilities so that they blend in with the surrounding landscape.

Using two-track and existing roads and centralizing gas compression facilities along existing roads will minimize the visual impact of the road network.

Use buried power lines to each well, where feasible, to reduce the linear element in the landscape.

Construction debris will be removed immediately.

Resource protection measures proposed for erosion control, road construction, rehabilitation and revegetation, and wildlife protection will be implemented during approval of APDs and sundry notices. These measures also will mitigate impacts to visual quality.

Noise

Compressors should be located at least 600 feet from sensitive receptors (residences, schools, medical facilities, and recreation areas). Under current Wyoming law, the WDEQ can only require this mitigation to occur if municipal or county land use plans address siting of noise emitters.

Appendix N
Integrated Pest Management Plan

Integrated Pest Management Plan

An integrated pest management (IPM) plan is a required component of all coal bed methane (CBM) project Plans of Development (POD) and individual oil and gas Applications for Permit to Drill (APD). The IPM plan will include:

- Preventive practices to avoid the transport and spread of weeds and weed seed during energy development and production activities.
- A plan to control noxious weeds and weeds of local concern within specific project areas.
- A strategy to educate field employees and contractors in noxious weed identification and awareness.

Noxious weed infestations can occur both directly and indirectly from energy and related development. Weeds and weed seed can be transported and spread with road surfacing and other construction and reclamation materials. Weeds and weed seed can also be attached to equipment and vehicles and spread over great distances. Physical soil disturbance such as the construction of pipelines, access roads, well locations and water management structures, as well as the soil moisture and chemical alterations from produced water discharge, stream flow and storage create numerous opportunities for the introduction, infestation and spread of noxious and other weeds of concern.

The following are guidelines to follow in the development of an Integrated Pest Management (IPM) Plan:

I. Incorporate weed prevention into design, layout and construction of access roads, pipelines, well locations and other facilities.

1. Identify areas of (1) noxious weeds, (2) other weeds of concern and (3) biological agent insectaries in the area encompassed by the APD or POD. Data on noxious weeds and their biological agents can be obtained from:

    - Landowner if not BLM surface
    - County weed board data base and weed location information
    - Inventory by knowledgeable person
    - Bureau of Land Management, Natural Resources Conservation Service or other federal/state agency

2. Describe landscape, soils, desirable vegetation present, distance to open water/water table and land use as they pertain to the project proposal. Weeds are more commonly found along drainages and streams; areas with deeper, more productive soils; and in areas previously disturbed or overgrazed.

    - Identify areas with the greatest potential for weed infestation.

- Include proposed strategy to limit disturbance/impacts in areas infested by and/or susceptible to the introduction of weeds in the plan of development.

3. Pipelines, access roads and drainages with flowing produced water can create corridors/conduits for weed spread and produced water storage structures (discharge points, reservoirs, off-channel containment structures, etc.) can harbor weeds and invasive plants.

   - Locate pipelines, roads, produced water outfalls/reservoirs where least likely to facilitate weed introduction and spread.

II. Treat noxious weed and weeds of local concern infestations within project areas as necessary to control and contain. Determine the best methods to treat weed(s), as they pertain to the specific situation; consider landscape, soils, desirable vegetation present, distance to open water/water table, land use and other pertinent factors.

1. Control noxious weeds and invasive plants during construction, production and reclamation using an integrated approach, which involves the most effective combination of the following methods.

   - Cultural

     a. The prompt reseeding and revegetation of areas of disturbed soils with certified seed.
     b. Encourage the cleaning of equipment and vehicles prior to entering and leaving the each work site.
     c. Minimize surface disturbance, where possible. This is especially important in areas of known weed populations and/or areas susceptible to weed infestation.

   - Physical

     a. To control annual and noxious weeds, consider mowing newly revegetated areas during the first season of establishment, prior to weed seed formation.
     b. In some unique circumstances, controlled burning may reduce the infestation of some weed species. Ensure that necessary approval is obtained and exercise extreme caution when considering/utilizing this option.

   - Biological

     a. Utilize approved/available biological control agent (usually an insect) if it would be effective for the weed species considered for control.
     b. Consider domestic animals for control of specific weed species.

- Chemical

  a. Consider weed species, the site on which herbicide will be applied and desired result when selecting appropriate herbicide for noxious weed control.
  b. Ensure selected herbicide is approved for weed(s) to be controlled, for type of application and that herbicide label is otherwise consistent with intended use. Strictly adhere to herbicide label.
  c. Ensure that all herbicides are handled and applied by properly trained and licensed personnel.

2. On BLM administered public lands, an approved Pesticide Use Permit (PUP) is required to apply chemical herbicide and an approved Biological Release Permit (BRP) is required for the release of biological agents.. The necessary forms and direction will be included with the approved POD or APD and/or may be obtained from your local BLM office.

- See current list of herbicides approved for application on Bureau of Land Management administered lands.

3. On private lands first consult the private surface owner as to the desired method(s) for the control/treatment of noxious weeds/invasive plants.

III. Incorporate weed prevention and control measures into environmental restoration and infrastructure maintenance activities.

1. Use only certified weed-free hay, straw and/or other organic mulches used for erosion control and other environmental restoration activities.

2. Use only road surfacing and other earthen materials for construction/maintenance that are certified weed-free.

3. Clean all vehicles and equipment used in construction, drilling, restoration and maintenance activities by pressure washing, or other effective means. Ensure that all equipment/vehicles are weed-free prior to transporting into new areas of development.

4. Reseed all areas not utilized for production/maintenance immediately following construction and reclamation activities.

5. Use only certified weed-free seed for the reclamation of areas disturbed by coal bed methane development or related activities.

IV. Minimize weed seed source and limit opportunity of weed seed transport/spread into weed-free areas.

1. Identify and treat/remove weed seed sources that are within/adjacent to pipelines, access roads, produced water courses and other areas where noxious weed seed could be picked up by vehicles or flowing water and spread into weed free areas.

2. Prevent the accidental transport and spread of weeds and weed seeds into new areas of development.

    - Clean all construction equipment and vehicles of mud, dirt and plant parts before coming onto and leaving work sites.
    - Transport/use only gravel or other earthen fill material from certified weed-free sources.

V. Initiate a weed education policy to assist contractors and field employees in the identification of noxious weeds and to create an awareness of the impacts that noxious weeds and invasive plants have on the environment.

1. Participate in cooperative education and awareness programs with county weed districts, state and federal agencies and educational institutions.

2. Encourage contractors and employees to report new noxious weed infestations to company representative responsible for weed management and the appropriate county weed board.

3. Distribute and review weed education material at onsite inspections and pre-construction conferences.

Appendix O

Current RMP and LRMP Decisions on Areas Open or Closed to Leasing

Appendix O — Current RMP and LRMP Decisions on Areas Open or Closed to Leasing

Distribution of Area Leasing and Stipulations by Federal Management Responsibility within the Project Area

			TBNG		
Parameter	Buffalo RMP	Casper RMP	1985 LRMP	2002 LRMP	Total
Area Closed to Leasing					
National Policy Closures (WSAs)	1,333	0	0	0	1,333
Planning Decision Closures (Cities and Towns)	28,867	0	0	0	28,867
Area Open to Oil and Gas Leasing					
Within CBM-productive coals[1]	2,382,929	445,145	95,443	0	2,923,517
Outside CBM-productive coals	1,082,583	367,453	0	161,381	1,611,417
Area not Leased but Available as of Aug. 2001					
Within CBM-productive coals	119,585	49,153	15,351	0	184,089
Outside CBM-productive coals	312,461	16,009	0	0	328,470
Area Leased with Stipulations					
No Surface Occupancy					
Within CBM-productive coals	35,036	8,555	32,267[2]	0	75,858
Outside CBM-productive coals	6,729	4,744			7,203
Controlled Surface Use					
Within CBM-productive coals	84,684	24,444	654[2]	0	116,561
Outside CBM-productive coals	14,686	5,755			
Paleontological			213,927[2]		213,927
Timing Limitation					
Within CBM-productive coals	556,952	122,207	62,994[2]		773,337
Outside CBM-productive coals	135,356	57,196			192,552

Notes:

1. CBM-productive coals are coal beds that are at least 20 feet thick.
2. Forest Service acreage was calculated based on the TBNG plan database.
3. Because areas may have more than one type of stipulation, the total area with stipulations plus SLT may be larger than the area open for leasing.

Buffalo Field Office Area

Consistent with the current RMP, the only federal oil and gas that will not be leased in the BFOA are areas within incorporated cites and towns, such as Sheridan, Buffalo, and Gillette, and the three WSAs (BLM 2001a). The rest of the federal minerals in the BFOA are open to oil and gas leasing.

Casper Field Office Area

Consistent with the current RMP, there are no areas closed to leasing within the CFO's portion of the Project Area.

Thunder Basin National Grassland

Consistent with the current LRMP, there are no areas closed to leasing within the FS portion of the Project Area. The decision to make lands available for leasing was made in the 1994 ROD for the oil and gas leasing on the TBNG. The July 2002 ROD for the Revised TBNG LRMP deferred new leasing decisions on the area west of the Wyodak coal outcrop line until the cumulative effects of CBM were disclosed in this PRB analysis. Therefore, on TBNG lands with potential for CBM, the oil and gas decisions in the 1994 ROD are in effect until changed in accordance with this PRB analysis.

Appendix P

Review of Leases, Lease Notices, and Lease Stipulations

Appendix P — Review of Leases, Lease Notices and Lease Stipulations

Leases

Within the limits of applicable laws and regulations, oil and gas leases grant the lessee the right to use the leased land as needed to explore for, drill for, extract, remove, and dispose of oil and gas deposits located under the leased lands. Subsequent approvals are required before the lessee can disturb the surface in exercise of lease rights. Standard lease terms (SLT) and special stipulations attached to the leases restrict the rights contained therein. Operations are required, by lease terms and stipulations, to minimize adverse impacts to the land, air, water, cultural, biological, and visual elements of the environment, as well as other land uses or users. Additional protective measures are contained in the Onshore Oil and Gas Operations regulations (43 CFR 3160), associated Onshore Orders, and published Notices to Lessees.

Special stipulations attached to leases generally fall into the following three categories:

- *No Surface Occupancy (NSO)* — Neither exploration nor production facilities (for example, well pads, drilling rigs, and CMFs) would be allowed to be constructed.
- *Controlled Surface Use (CSU)* — Surface occupancy and use are permitted, but are restricted to mitigate effects to particular resources. The CSU stipulation provides for mitigation measures that would not normally be met by relocating the drilling site the 656 feet (200 meters) provided by the SLT.
- *Timing Limitations (TL)* — Construction activities would be restricted or prohibited during certain periods to protect resources. The TL stipulation provides for mitigation measures that would not normally be met by delaying surface-disturbing operations for the 60 days each year provided by the SLT.

Lease Notices Applied by BLM

In addition to lease stipulations, lease notices (LN) may be attached to a lease to convey certain operational, procedural, or administrative requirements within the standard terms and conditions of the lease that are designed to alert the lessee of issues or values of special concern. Currently, BLM applies only one LN to leases in the PRB.

Lease Notice No. 1

The lands within this lease may include areas not specifically addressed by lease stipulations that may contain special values, may be needed for special purposes, or may require special attention to prevent damage to surface and other resources. Possible special areas are identified below. Any surface use or occupancy within such special areas will be strictly controlled or, if absolutely necessary, prohibited. Appropriate modifications to imposed restrictions will be made for the maintenance and operation of producing wells.

1. Slopes in excess of 25 percent.
2. Within 500 feet of surface water and/or riparian areas.
3. Construction with frozen material or during periods when the soil material is saturated or when watershed damage is likely to occur.
4. Within 500 feet of interstate highways and 200 feet of other existing rights-of-way (U.S. and state highways, roads, railroads, pipelines, and power lines).
5. Within ¼ mile of occupied dwellings.
6. Material sites.

The intent of this notice is to inform interested parties (potential lessees, permittees, operators) that when one or more of the above conditions exist, surface disturbing activities will be prohibited unless or until the permittee or the designated representative and the surface management agency (SMA) arrive at an acceptable plan for mitigation of anticipated impacts. This negotiation will occur before development and becomes a COA when authorizing the action.

Specific threshold criteria (for example, 500 feet from water) have been established based upon the best information available. However, geographical areas and time periods of concern must be delineated at the field level ("surface water and/or riparian areas" may include both intermittent and ephemeral water sources or may be limited to perennial surface water).

The referenced oil and gas leases on these lands are hereby made subject to the stipulation that the exploration or drilling activities will not interfere materially with the use of the area as a materials site/free use permit. At the time operations on the above lands are commenced, notification will be made to the appropriate agency. The name of the appropriate agency may be obtained from the proper BLM Field Office.

Lease Notices Applied by the FS

Currently, the FS applies two LNs to leases on the TBNG. One LN is for cultural and paleontological resources and the second is for endangered and threatened species. Both LNs are described below:

Cultural and Paleontological Resources

The FS is responsible for assuring that the leased lands are examined to determine if cultural resources are present and to specify mitigation measures. Before undertaking any surface-disturbing activities on the lands covered by this lease, the lessee or operator, unless notified to the contrary by the FS, shall:

1. Contact the FS to determine if a site-specific cultural resource inventory is required. If a survey is required, then:
2. Engage the services of a cultural resource specialist acceptable to the FS to conduct a cultural resource inventory of the area of proposed surface disturbance. The operator may elect to inventory an area larger than the area of proposed disturbance to cover possible site relocation that may result from environmental or other considerations. An acceptable inventory report is to be submitted to the FS for review and approval at the time a surface-disturbing plan of operation is submitted.
3. Implement mitigation measures required by the FS and BLM to preserve or avoid destruction of cultural resource values. Mitigation may include relocation of proposed facilities, testing, salvage, recordation or other protective measures. All costs of the inventory and mitigation will be borne by the lessee or operator, and all data and materials salvaged will remain under the jurisdiction of the U.S. Government as appropriate.

The lessee or operator shall immediately bring to the attention of the FS and BLM any cultural or paleontological resources or any other objects of scientific interest discovered as a result of surface operations under this lease and shall leave such discoveries intact until directed to proceed by FS and BLM.

Endangered or Threatened Species

The FS is responsible for assuring that the leased land is examined prior to undertaking any surface-disturbing activities to determine effects upon any plant or animal species listed or proposed for listing as endangered or threatened, or their habitats. The findings of this examination may result in some restrictions to the operator's plans or even disallow use and occupancy that would be in violation of the ESA by detrimentally affecting endangered or threatened species or their habitats.

The lessee or operator may, unless notified by the FS that the examination is not necessary, conduct the examination on the leased lands at his discretion and cost. This examination must be done by or under the supervision of a qualified resource specialist approved by the FS. An acceptable report must be provided to the FS identifying the anticipated effects of a proposed action on endangered or threatened species or their habitats.

Leases Stipulations

Existing federal oil and gas leases within the Project Area contain various stipulations concerning surface disturbance, surface occupancy, limited surface use, and timing (seasonal) restrictions. These lease stipulations provide for the imposition of such reasonable conditions, not inconsistent with the purposes for which the lease was issued, as the BLM and or FS may require to protect the surface of the leased lands and the environment. BLM and the FS have applied a variety of stipulations to oil and gas leases on federally administered lands within the Project Area. Although similarities exist, the stipulations vary by management area (BFOA, CFOA, and TBNG). The stipulations currently being applied to leases within each management area are discussed below. These stipulations would continue to be used.

Every two months, each BLM Field Office receives a list of lease parcels proposed for sale. Each parcel is reviewed by resource specialists for compliance with the RMP and a determination of NEPA adequacy. Each parcel is reviewed and pertinent lease notices and/or lease stipulations are attached.

This information is sent to the Wyoming State Office mineral leasing section to be included in the next competitive sale auction held in Cheyenne. A company that successfully bids on and obtains a lease parcel is mandated to comply with the stipulations contained on the lease unless the company receives written exception, modification, or waiver of the lease stipulations. Additionally a company is mandated to comply with federal mandates such as the Historic Preservation Act and ESA should these resources be identified before or during construction.

Buffalo Field Office Area

This section lists the stipulations that have been and would continue to be applied and a short explanation of the reasons for each stipulation.

Resource:	**Special Management Areas**
Stipulation:	No Surface Occupancy
Objective:	To preclude surface-disturbing activities or occupancy within special management areas, such as state big game winter ranges, Red Wall, Hole-in-the-Wall, Middle Fork Canyon, Petrified Tree, Fortification Creek, Cantonment Reno, and Dullknife Battlefield.
Waiver:	A waiver may be granted if it is determined that the action could occur without causing significant adverse impacts.
Exception:	None.
Modification:	None.
Justification:	Each of these areas contains one or a combination of important resources such as wildlife habitat, wildlife diversity, high visual quality, and significant cultural, historic, or paleontological values.

The Fortification Creek Special Management Area (FCSMA), approximately 25 miles northwest of Gillette, has had mitigation measures established since 1980. In 1980, BLM completed a programmatic oil and gas environmental assessment for the BFOA. The FCSMA was included in that EA. The EA described specific mitigation for development of oil and gas resources in the FCSMA. The objective was to protect wildlife, scenic, recreational, and cultural values in the area. The mitigation measures were as follows:

1. No surface occupancy on slopes of 25 percent or more.
2. Power lines will be buried.
3. No surface disturbance in elk calving grounds May 1 to June 30.
4. No surface disturbance in elk critical winter range from November 30 to April 30.
5. Replacement of trees removed with containerized seedlings.
6. Barricading rehabilitated access roads to prevent vehicular travel.
7. Muffling engines so that noise levels do not exceed 86 decibels at 50 feet.

The FCSMA includes both public and split estate lands. Private surface and mineral lands and State of Wyoming lands are also within the boundary. The mitigation measures did not apply to private and state lands.

In 1982, the Fortification Creek Oil and Gas EA was completed and provided more detail regarding management of the area.

Specific stipulations that were carried forward from the 1980 and 1982 EAs into the 1985 RMP were as follows:

1. Timing stipulation – elk crucial winter range (26,000 acres) No surface disturbance in elk critical winter range from November 30 to April 30.
2. No surface occupancy – elk parturition (calving) areas (approximately 5,700 acres)

The Fortification Creek Wilderness Study Area was also established in the early 1980s. The WSA contained "interim management" guidelines, which are still in effect until such time as Congress acts on this proposal. The WSA lies within the FCSMA. Interim management called for no oil and gas leasing on those lands within the boundary of the WSA.

Based on the need to standardize oil and gas stipulations and direction from the Wyoming State Office, in 1990, RMPs throughout the state were amended to incorporate the standard mitigation guidelines. This action was to provide consistency in lease stipulations throughout the state. At that time, the controlled surface use stipulation was applied to the FCSMA.

CSU (1) Surface occupancy or use within the FCSMA will be restricted or prohibited unless the operator and surface managing agency arrive at an acceptable plan for mitigation of anticipated impacts. This may include development and operations and maintenance of facilities; (2) entire lease; (3) protecting elk crucial winter range. (This stipulation would only be applied if new information shows such is needed and is agreed upon by the Field Manager and the RMP is amended.)

In 1995, the WGFD completed a study using radio-collared elk. The outcome of the study changed the distribution of elk crucial winter, winter yearlong, and parturition areas compared to those identified in the earlier 1980 and 1982 EAs. The areas were expanded as follows:

Timing stipulation – elk crucial winter range (38,234 acres)

Timing stipulation – elk parturition range (59,292 acres).

Controlled Surface Use stipulations **may** include the following "Conditions of Approval" for CBM development:

- All wells would have radio-telemetry monitoring.

- human activity including construction will be during the hours of _____ and _____.

-reclamation will include seed mixtures or potted trees as described in the "conditions of approval."

-compressors will be adequately muffled or placed so as to minimize disturbance to wildlife and scenic or other values in the area.

-other as appropriate to protect site-specific values.

These CSU measures are applied based upon site-specific characteristics such as tree cover, historic elk use and juxtaposition relative to other surface disturbance or human activities.

Resource:	**Crucial Elk Winter Range**
Stipulation:	Timing Limitation
Objective:	To preclude new surface-disturbing activities within crucial elk winter range, which could cause increased stress to and/or displacement of animals during the critical time period (November 15 to April 30).
Waiver:	A waiver may be granted if new habitat studies in coordination with the WGFD conclude that the area affected by this stipulation is no longer used as winter range. A waiver also may be granted if, after consultation with the WGFD, it is determined that activities within the area would help temporarily disperse the elk from areas of intense use and provide a tool for herd management.
Exception:	An exception may be granted if seasonal conditions (for example, an early spring and snowmelt) are such that the elk have moved out of and are not using the general area during the particular year.
Modification:	A modification of the stipulation may be granted if new habitat studies show that a portion of the area is not used as winter range.

Justification: SLT provide for delay of activities for up to 60 days. Because the critical period extends for about 140 days, the SLT would not be adequate. The No Lease option and NSO stipulation were deemed to be overly restrictive because operations conducted outside the wintering period would have minimal effects on the elk.

Resource: **Elk Calving**

Stipulation: Timing Limitation

Objective: To preclude new surface-disturbing activities within elk calving areas, which could cause increased stress to and/or displacement of animals during the critical time period (May 1 to June 30).

Waiver: A waiver may be granted if new habitat studies in coordination with the WGFD conclude that the area affected by this stipulation is no longer used as a calving area. A waiver also may be granted if, after consultation with the WGFD, it is determined that activities within the area would help temporarily disperse the elk from areas of intense use and provide a tool for herd management.

Exception: An exception may be granted if seasonal conditions (e.g., an early spring and snowmelt) are such that the elk have moved out of and are not using the general area during the particular year.

Modification: A modification of the stipulation may be granted if new habitat studies show that a portion of the area is not used as a calving area.

Justification: This stipulation is needed to reduce effects of stress during the calving season.

Resource: **Sage Grouse Breeding Areas**

Stipulation: Controlled Surface Use

Objective: To minimize adverse effects, activities within ¼ mile of a sage grouse strutting/dancing ground will be restricted or prohibited.

Waiver: A waiver may be granted if new habitat studies in coordination with the WGFD conclude that the area affected by this stipulation is no longer used by sage grouse as a breeding area. A waiver also may be granted if the operator and surface management agency arrive at an acceptable plan for mitigation of anticipated effects.

Exception: None.

Modification: A modification of the stipulation may be granted if new habitat studies show that a portion of the area is not used as a breeding area.

Justification: A CSU stipulation is needed to ensure minimal effects on integrity and use of sage grouse breeding areas. The No Lease option and NSO stipulation were deemed to be overly restrictive because operations could be conducted outside the 0.25 mile buffer around the breeding area with minimal effects on the sage grouse.

Resource: **Sage Grouse Nesting Habitats**

Stipulation: Timing Limitation

Objective: To preclude new surface-disturbing activities within sage grouse nesting habitats, an additional 1.75-mile radius would be established beyond the 0.25-mile lek radius, which could cause increased stress to and/or displacement of animals during the critical time period (March 1 to June 15).

Waiver: A waiver may be granted if new habitat studies in coordination with the WGFD conclude that the area affected by this stipulation is no longer used by sage grouse as nesting habitat.

Exception: An exception may be granted if seasonal conditions are such that the sage grouse have moved out of and are not using the general area during the particular year.

Modification: A modification of the stipulation may be granted if new habitat studies show that a portion of the area is not used as nesting habitat.

Justification: SLT provide for delay of activities for up to 60 days. Because the critical period extends for about 150 days, the SLT would not be adequate. The No Lease option and NSO stipulation were deemed to be overly restrictive because operations conducted outside the nesting period would have minimal effects on the sage grouse.

Resource: **Sharp-tailed Grouse Breeding Areas**

Stipulation: Controlled Surface Use

Objective: To minimize adverse effects, activities within 250 yards of a sharp-tailed grouse strutting/dancing ground will be restricted or prohibited.

Waiver: A waiver may be granted if new habitat studies in coordination with the WGFD conclude that the area affected by this stipulation is no longer used by sharp-tailed grouse as a breeding area. A waiver also may be granted if the operator and surface management agency arrive at an acceptable plan for mitigation of anticipated effects.

Exception: None.

Modification: A modification of the stipulation may be granted if new habitat studies show that a portion of the area is not used as a breeding area.

Justification: A CSU stipulation is needed to ensure minimal effects on integrity and use of sharp-tailed grouse breeding areas. The No Lease option and NSO stipulation were deemed to be overly restrictive because operations could be conducted outside the 0.25 mile buffer around the breeding area with minimal effects on the sharp-tailed grouse.

Resource: **Sharp-tailed Grouse Nesting Habitats**

Stipulation: Timing Limitation

Objective: To preclude new surface-disturbing activities within sharp-tailed grouse nesting habitats, an additional 0.5-mile radius would be established beyond the 250 yard lek radius, which could cause increased stress to and/or displacement of animals during the critical time period (April 1 to May 31).

Waiver: A waiver may be granted if new habitat studies in coordination with the WGFD conclude that the area affected by this stipulation is no longer used by sharp-tailed grouse as nesting habitat.

Exception: An exception may be granted if seasonal conditions are such that the sharp-tailed grouse have moved out of and are not using the general area during the particular year.

Modification: A modification of the stipulation may be granted if new habitat studies show that a portion of the area is not used as nesting habitat.

Justification: SLT provide for delay of activities for up to 60 days. Because the critical period extend for about 150 days, the SLT would not be adequate. The No Lease option and NSO stipulation were deemed to be overly restrictive because operations conducted outside the nesting period would have minimal effects on the sharp-tailed grouse.

Resource: **Raptor Nesting Habitat**

Stipulation: Timing Limitation

Objective: To preclude new surface-disturbing activities within 0.5 mile of raptor nest sites, which could cause increased stress to and/or displacement of animals during the critical time period (February 1 to July 31).

Waiver: A waiver may be granted if new habitat studies, in coordination with the WGFD and FWS, conclude that the nest sites affected by this stipulation are no longer used by raptors.

Exception: An exception may be granted if seasonal conditions are such that the raptors have moved out of and are not using the nest sites during the particular year.

Modification: A modification of the stipulation may be granted if new habitat studies show that a portion of the area is not used as nesting habitat.

Justification: SLT provide for delay of activities for up to 60 days. Because the critical period extends for about 180 days, the SLT would not be adequate. The No Lease option and NSO stipulation were deemed to be overly restrictive because operations conducted outside the nesting period would have minimal effects on raptors.

Resource: Bald Eagle Winter Roosts

Stipulation: Timing Limitation

Objective: To preclude new surface-disturbing activities within 1 mile of bald eagle winter roosts, which could cause increased stress to and/or displacement of animals during the critical time period (November 1 to April 1).

Waiver: A waiver may be granted if new habitat studies, in coordination with the WGFD and FWS, conclude that winter roosts affected by this stipulation are no longer used by bald eagles.

Exception: An exception may be granted if seasonal conditions are such that the bald eagles have moved out of and are not using the winter roost during the particular year.

Modification: A modification of the stipulation may be granted if new habitat studies show that a portion of the area is not used as winter roosts.

Justification: SLT provide for delay of activities for up to 60 days. Because the critical period extends for about 150 days, the SLT would not be adequate. The No Lease option and NSO stipulation were deemed to be overly restrictive because operations conducted outside the winter period would have minimal effects on bald eagles.

Resource: Bozeman Trail

Stipulation: Controlled Surface Use

Objective: To protect the cultural and scenic values of the Bozeman Trail, activities within ¼ mile or the visual horizon (whichever is closer) of the Bozeman Trail will be restricted or prohibited.

Waiver: A waiver may be granted if the operator and surface management agency arrive at an acceptable plan for mitigation of anticipated effects.

Exception: None.

Modification: None.

Justification: A CSU stipulation is needed to ensure minimal effects on the cultural and scenic values of the Bozeman Trail. The No Lease option and NSO stipulation were deemed to be overly restrictive because operations could be conducted outside the ¼ mile buffer or visual horizon with minimal effects on the cultural and scenic values of the Bozeman Trail.

Resource: **Fortification Creek Special Management Area**

Stipulation: Controlled Surface Use

Objective: To protect the wildlife, scenic, and watershed values of the FCSMA.

Waiver: A waiver may be granted if the operator and BLM arrive at an acceptable plan for mitigation of anticipated effects.

Exception: None.

Modification: None.

Justification: A CSU stipulation is needed to ensure minimal effects on the wildlife, scenic, and watershed values in the FCSMA. The No Lease option and NSO stipulation were deemed to be overly restrictive because operations could be conducted and facilities constructed (e.g., buried) with minimal effects on the wildlife, scenic, and watershed values.

Resource: **Severe Erosion Hazard Areas**

Stipulation: Timing Limitation

Objective: To protect areas with severe erosion hazards from erosion.

Waiver: Surface-disturbing activities will be prohibited unless or until the permittee or the designated representative and the BLM arrive at an acceptable plan for mitigation of anticipated impacts.

Exception: None.

Modification: None.

Justification: SLT provide for delay of activities for up to 60 days. Because the critical period may extend for much more than 60 days, the SLT would not be adequate. The No Lease option and NSO stipulation were deemed to be overly restrictive.

Resource: **Threatened and Endangered Species**

Stipulation: Controlled Surface Use – The lease area may now or hereafter contain plants, animals, or their habitats determined to be threatened, endangered, or other special status species. BLM may recommend modification to explorations and development proposals to further its conservation and management objectives to avoid BLM-approved activity that will contribute to a need to list such a species or their habitat. BLM may require modification to or disapprove proposed activity that that is likely to result in jeopardy to the continued existence of a proposed or listed threatened or endangered species or result in the destruction or adverse modification of a designated or proposed critical habitat.

BLM will not approve any ground disturbing activity that may affect any such species or critical habitat until it completes its obligations under applicable requirements of the Endangered Species Act as amended, 16 U.S.C. 1531 et seq., including completion of any required procedure for concurrence or consultation.

Objective: To protect Threatened and Endangered Species

Waiver: None

Exception: None

Modification: None

Justification: To meet the requirements of ESA as amended.

Casper Field Office Area

The following are the resource values identified from the Platte River RMP for which stipulations may be applied:

Resource: **Sage Grouse Breeding Areas**

Stipulation: Controlled Surface Use

Objective: To minimize adverse effects, activities within ¼ mile of a sage grouse strutting/dancing ground will be restricted or prohibited.

Waiver: A waiver may be granted if new habitat studies in coordination with the WGFD conclude that the area affected by this stipulation is no longer used by sage grouse as a breeding area. A waiver also may be granted if the operator and surface management agency arrive at an acceptable plan for mitigation of anticipated effects.

Exception: None.

Modification: A modification of the stipulation may be granted if new habitat studies show that a portion of the area is not used as a breeding area.

Justification: A CSU stipulation is needed to ensure minimal effects on integrity and use of sage grouse breeding areas. The No Lease option and NSO stipulation were deemed to be overly restrictive because operations could be conducted outside the 0.25-mile buffer around the breeding area with minimal effects on the sage grouse.

Resource: **Sage Grouse Nesting Habitats**

Stipulation: Timing Limitation

Objective: To preclude new surface-disturbing activities within sage grouse nesting habitats, no surface use is allowed within 1.75 miles from the 0.25-mile protection zone between March 1 and June 15 so that the nesting area around the strutting and dancing ground can be protected.

Waiver: A waiver may be granted if new habitat studies in coordination with the WGFD conclude that the area affected by this stipulation is no longer used by sage grouse as nesting habitat.

Exception: The authorized officer may authorize exceptions to the time and distance limitations in any particular year.

Modification: A modification of the stipulation may be granted if new habitat studies show that a portion of the area is not used as nesting habitat.

Justification: A TL stipulation is needed to ensure minimal effects on integrity and use of sharp-tailed grouse nesting areas. The No Lease option and NSO stipulation were deemed to be overly restrictive because operations could be conducted outside the 0.25-mile buffer around the breeding area with minimal effects on the sage grouse.

Resource: **Sharp-tailed Grouse Breeding Areas**

Stipulation: Controlled Surface Use

Objective: To minimize adverse effects, activities within 0.25 mile of a sharp-tailed grouse strutting/dancing ground will be restricted or prohibited.

Waiver: A waiver may be granted if new habitat studies in coordination with the WGFD conclude that the area affected by this stipulation is no longer used by sharp-tailed grouse as a breeding area. A waiver also may be granted if the operator and surface management agency arrive at an acceptable plan for mitigation of anticipated effects.

Exception: None.

Modification: A modification of the stipulation may be granted if new habitat studies show that a portion of the area is not used as a breeding area.

Justification: A CSU stipulation is needed to ensure minimal effects on integrity and use of sharp-tailed grouse breeding areas. The No Lease option and NSO stipulation were deemed to be overly restrictive because operations could be conducted outside the 0.25-mile buffer around the breeding area with minimal effects on the sharp-tailed grouse.

Resource: **Sharp-tailed Grouse Nesting Habitats**

Stipulation: Timing Limitation

Objective: To preclude new surface-disturbing activities within sharp-tailed grouse nesting habitats, no surface use is allowed within 1.75 miles from the 0.25-mile protection zone between March 1 and June 15 so that the nesting area around the strutting and dancing ground can be protected.

Waiver: A waiver may be granted if new habitat studies in coordination with the WGFD conclude that the area affected by this stipulation is no longer used by sharp-tailed grouse as nesting habitat.

Exception: The authorized officer may authorize exceptions to the time and distance limitations, in any particular year.

Modification: A modification of the stipulation may be granted if new habitat studies show that a portion of the area is not used as nesting habitat.

Justification: A TL stipulation is needed to ensure minimal effects on integrity and use of sharp-tailed grouse nesting areas. The No Lease option and NSO stipulation were deemed to be overly restrictive because operations could be conducted outside the 0.25-mile buffer around the breeding area with minimal effects on the sharp-tailed grouse.

Resource: Raptor Nesting Habitat

Stipulation: Timing Limitation

Objective: To preclude new surface-disturbing activities within 0.5 mile of raptor nest sites, which could cause increased stress to and/or displacement of animals during the critical time period (February 1 to July 31).

Waiver: A waiver may be granted if a new habitat study, in coordination with the WGFD and FWS, concludes that the nest sites affected by this stipulation are no longer used by raptors.

Exception: An exception may be granted if seasonal conditions are such that the raptors have moved out of and are not using the nest sites during the particular year.

Modification: A modification of the stipulation may be granted if new habitat studies show that a portion of the area is not used as nesting habitat.

Justification: SLT provide for delay of activities for up to 60 days. Because the critical period extends for about 180 days, the SLT would not be adequate. The No Lease option and NSO stipulation were deemed to be overly restrictive because operations conducted outside the nesting period would have minimal effects on raptors.

Resource: Bald Eagle Winter Roosts

Stipulation: Timing Limitation

Objective:	To preclude new surface-disturbing activities within 1 mile of bald eagle winter roosts, which could cause increased stress to and/or displacement of animals during the critical time period (November 1 to April 1).
Waiver:	A waiver may be granted if new habitat studies, in coordination with the WGFD and FWS, conclude that winter roosts affected by this stipulation are no longer used by bald eagles.
Exception:	An exception may be granted if seasonal conditions are such that the bald eagles have moved out of and are not using the winter roost during the particular year.
Modification:	A modification of the stipulation may be granted if new habitat studies show that a portion of the area is not used as winter roosts.
Justification:	SLT provide for delay of activities for up to 60 days. Because the critical period extend for about 150 days, the SLT would not be adequate. The No Lease option and NSO stipulation were deemed to be overly restrictive because operations conducted outside the winter period would have minimal effects on bald eagles.
Resource:	**Threatened and Endangered Species**
Stipulation:	Controlled Surface Use – The lease area may now or hereafter contain plants, animals, or their habitats determined to be threatened, endangered, or other special status species. BLM may recommend modification to explorations and development proposals to further its conservation and management objectives to avoid BLM-approved activity that will contribute to a need to list such a species or their habitat. BLM may require modification to or disapprove proposed activity that that is likely to result in jeopardy to the continued existence of a proposed or listed threatened or endangered species or result in the destruction or adverse modification of a designated or proposed critical habitat. BLM will not approve any ground disturbing activity that may affect any such species or critical habitat until it completes its obligations under applicable requirements of the Endangered Species Act as amended, 16 U.S.C. 1531 et seq., including completion of any required procedure for concurrence or consultation.
Objective:	To protect Threatened and Endangered Species
Waiver:	None
Exception:	None
Modification:	None
Justification:	To meet the requirements of ESA as amended.

On public lands, surface development will be prohibited on an area from 0.25 to 1 mile of known or discovered nests. The specific distance and dimensions of the area on which surface development will be prohibited will be determined on a case-by-case basis after consultation with the FWS in accordance with the ESA.

Thunder Basin National Grassland

Below are two sets of stipulations for the TBNG. Currently, the area west of the coal outcrop line (the area with potential for CBM) is available for leasing under the 1994 ROD for Oil and Gas Leasing on the TBNG. The area east of the coal outcrop line is available for leasing under the July 2002 ROD on the Revised 2001 TBNG LRMP. The stipulations associated with both LRMPs are presented below.

Current Lease Stipulations under the 1985 LRMP as Revised by the 1994 Oil and Gas Leasing Decision (for the FS lands west of the coal outcrop line)

Resource: **Wildlife**

Stipulation: Timing Limitation

Objective: To prevent oil and gas activities from causing degradation of the crucial wildlife habitat for LRMP Management Indicator Species, surface occupancy or use is subject to the following operating constraints:

1. No activities shall be allowed within 1 mile of an active bald eagle nest or peregrine falcon nest from February 1 to July 31, if they would cause nesting failure or abandonment.
2. No activities shall be allowed within 1 mile of an active bald eagle winter roost site from November 1 to April 1, if they would cause nesting failure or abandonment.
3. No activities shall be allowed within 0.25 mile of an active golden eagle nest from February 1 to July 31, if they would cause nesting failure or abandonment.
4. No activities shall be allowed within 0.25 mile of an active ferruginous hawk, Swainson's hawk, goshawk, osprey or prairie falcon nest from March 1 to July 31, if they would cause nesting failure or abandonment.
5. No activities shall be allowed within 0.25 mile of any rookery from March 1 to July 31, if they would cause abandonment of the rookery, unless specific practices are successfully implemented to maintain or increase the opportunities at other rookery sites.

Waiver: Waivers will be considered in accordance with the requirements of Title 36 Code of Federal Regulations Part 228. Environmental analysis meeting the requirements of NEPA will be conducted in considering the request. The Deciding Officer's decision will be based on this information.

Exception: Exceptions will be considered in accordance with the requirements of Title 36 Code of Federal Regulations Part 228. Environmental analysis meeting the requirements of NEPA will be conducted in considering the request. The Deciding Officer's decision will be based on this information.

Modification: Modifications will be considered in accordance with the requirements of Title 36 Code of Federal Regulations Part 228. Environmental analysis meeting the requirements of NEPA will be conducted in considering the request. The Deciding Officer's decision will be based on this information.

Justification: LRMP direction pages III–29 through III–36. Allowing development in crucial wildlife habitat for Management Indicator Species without special consideration generates an unacceptable risk of causing habitat degradation. Additionally, law protects many of the Management Indicator Species and the stipulation is to insure compliance with these laws.

Resource: **Wildlife**

Stipulation: Controlled Surface Use

Objective: To prevent degrading crucial wildlife habitat for LRMP Management Indicator Species by oil and gas activities, surface occupancy or use is subject to the following operating constraints:

1. No activities shall be allowed within 0.5 mile of an active bald eagle or peregrine falcon nest at any time if they would cause disturbance of the adult birds on the nest.
2. No activities shall be allowed within 300 feet of any golden eagle, ferruginous hawk, Swainson's hawk, goshawk, osprey, or prairie falcon nest at any time if they would cause nest abandonment, unless specific practices are successfully implemented to maintain or increase nesting opportunities at other sites. This does not apply to existing surface occupancies.
3. New roads or other developments shall be placed out of sight of the existing raptor nest if possible, unless specific practices are successfully implemented to maintain or increase nesting opportunities.
4. No activities shall be allowed within 0.25 mile of a sage grouse or sharp-tailed grouse lek at any time if they would cause abandonment of the lek, unless specific practices are successfully implemented to maintain or increase the existing habitat capability for grouse.

Waiver: Waivers will be considered in accordance with the requirements of Title 36 Code of Federal Regulations Part 228. Environmental analysis meeting the requirements of NEPA will be conducted in considering the request. The Deciding Officer's decision will be based on this information.

Exception: Exceptions will be considered in accordance with the requirements of Title 36 Code of Federal Regulations Part 228. Environmental analysis meeting the requirements of NEPA will be conducted in considering the request. The Deciding Officer's decision will be based on this information.

Modification: Modifications will be considered in accordance with the requirements of Title 36 Code of Federal Regulations Part 228. Environmental analysis meeting the requirements of NEPA will be conducted in considering the request. The Deciding Officer's decision will be based on this information.

Justification: LRMP direction pages III–29 through III–36. Allowing development in crucial wildlife habitat for Management Indicator Species without special consideration generates an unacceptable risk of causing habitat degradation. Additionally, law protects many of the Management Indicator Species and the stipulation is to insure compliance with these laws.

Resource: Soil and Water

Stipulation: Controlled Surface Use

Objective: To prevent landslides and mass soil movements being caused by oil and gas activities, surface occupancy or use is subject to the following operating constraints:

On areas identified as having a high potential for soil mass wasting and on unstable areas with slopes greater than 34 percent but less than 60 percent, no surface occupancy will be allowed unless:

1. No other reasonable alternatives exist, and
2. It is established to the authorized officer's satisfaction that the site-specific design for the facilities will not cause massive soil movement.

Waiver: Waivers will be considered in accordance with the requirements of Title 36 Code of Federal Regulations Part 228. Environmental analysis meeting the requirements of NEPA will be conducted in considering the request. The Deciding Officer's decision will be based on this information.

Exception: Exceptions will be considered in accordance with the requirements of Title 36 Code of Federal Regulations Part 228. Environmental analysis meeting the requirements of NEPA will be conducted in considering the request. The Deciding Officer's decision will be based on this information.

Modification: Modifications will be considered in accordance with the requirements of Title 36 Code of Federal Regulations Part 228. Environmental analysis meeting the requirements of NEPA will be conducted in considering the request. The Deciding Officer's decision will be based on this information.

Justification: LRMP direction, Page III–58, Item c, page III–59, Items c.1 and c.2. and pages III–74 through III–76. This stipulation applies to areas within the classification of "mass wasting potential areas" and slopes under 60 percent and over 34 percent that are unstable. Using these areas for the development of the oil and gas resource generates a risk of massive soil movement.

Resource: **Soil and Water**

Stipulation: Controlled Surface Use

Objective: To prevent oil and gas activities causing a significant and permanent decrease in soil productivity, surface occupancy or use are subject to the following operating constraints:

On areas identified as having a high potential for mass wasting and in riparian areas, no surface occupancy will be allowed unless:

1. No other reasonable alternatives exist, and
2. It is established to the authorized officer's satisfaction, that the site-specific design for the facilities will not cause massive soil movement.

Waiver: Waivers will be considered in accordance with the requirements of Title 36 Code of Federal Regulations Part 228. Environmental analysis meeting the requirements of NEPA will be conducted in considering the request. The Deciding Officer's decision will be based on this information.

Exception: Exceptions will be considered in accordance with the requirements of Title 36 Code of Federal Regulations Part 228. Environmental analysis meeting the requirements of NEPA will be conducted in considering the request. The Deciding Officer's decision will be based on this information.

Modification: Modifications will be considered in accordance with the requirements of Title 36 Code of Federal Regulations Part 228. Environmental analysis meeting the requirements of NEPA will be conducted in considering the request. The Deciding Officer's decision will be based on this information.

Justification: LRMP direction, Page III–58, Item c, page III–59, Items c.1 and c.2. and pages III–74 through III–76. Areas within the classification of "mass wasting potential areas" and slopes over 34 percent are unstable if disturbed significantly. Using these areas for the development of the oil and gas resources, including roads and pipelines, requires special consideration.

Riparian soils are sensitive and easily damaged. Using these areas for the development of the oil and gas resource, including roads and pipelines, requires special consideration.

Resource: **Soil and Water**

Stipulation: Controlled Surface Use

Objective: To prevent oil and gas activities from causing degradation of the riparian, playas, floodplains, and wetland values, surface occupancy or use is subject to the following operating constraints:

1. No other reasonable alternatives exist, and

2. It is established to the authorized officer's satisfaction that the development will meet LRMP Standards and Guidelines about riparian, playas, floodplains, and wetland areas.
   a. Design activities to protect and manage the riparian ecosystem.
      1. Initiate timely and effective rehabilitation of disturbed areas. Restore riparian areas so that a vegetation ground cover or suitable substitute protects the soil from erosion and prevents increased sediment yield.
      2. Maintain the integrity of the ecosystem, including quantity and quality of water.
   b. Locate oil and gas activities away from the water's edge or outside the riparian areas, playas, wetlands, and floodplains unless alternatives have been assessed and determined to be more environmentally damaging. If necessary to locate activities in these areas, then:
      1. Deposit no waste material (silt, sand, gravel, soil, slash, debris, chemicals, or other material) below high-water lines, in riparian areas, in areas immediately adjacent to riparian areas, or in natural drainage ways (draws, land surface depressions, or other areas where overland flow concentrates and flows directly into streams or lakes).
      2. Prohibit the depositing of soil material from drilling, processing or site preparation in natural drainage ways.
      3. Locate the lower edge of disturbed or deposited soil banks outside the active floodplain.
      4. Prohibit stockpiling of topsoil or any other disturbed soil in the active floodplain.
      5. Locate drilling mud pits outside riparian areas, playas, wetlands, and floodplains. If location is unavoidable in these areas, seal and dike all pits to prevent leakage.
      6. Drain and restore roads, pads, and drill sites immediately after use is discontinued. Revegetate to 80 percent of ground cover in the first year. Provide surface protection during stormflow and snowmelt runoff events.
      7. Avoid constructing roads, drill pads, and tank batteries in or immediately adjacent to riparian areas, playas, wetlands, and floodplains. Facilities will be located a sufficient distance from the water's edge so that sediment entering the water is minimized.
      8. Gravel pits shall be rehabilitated to simulate a natural riparian/aquatic situation if permitted in riparian zones.

9. Do not parallel streams when road location must occur in riparian areas except where absolutely necessary. Cross streams at right angles. Locate crossings at points of low bank slope and firm surfaces.

c. Riparian areas, playas, floodplains, and wetlands will not exceed a visual quality objective (VQO) of partial retention. This visual management system, as well as the terms partial retention and visual quality objective, are explained in the Forest Service manuals and handbooks.

Waiver: Waivers will be considered in accordance with the requirements of Title 36 Code of Federal Regulations Part 228. Environmental analysis meeting the requirements of NEPA will be conducted in considering the request. The Deciding Officer's decision will be based on this information.

Exception: Exceptions will be considered in accordance with the requirements of Title 36 Code of Federal Regulations Part 228. Environmental analysis meeting the requirements of NEPA will be conducted in considering the request. The Deciding Officer's decision will be based on this information.

Modification: Modifications will be considered in accordance with the requirements of Title 36 Code of Federal Regulations Part 228. Environmental analysis meeting the requirements of NEPA will be conducted in considering the request. The Deciding Officer's decision will be based on this information.

Justification: LRMP direction pages III–51 through III–53 and pages III–74 through III–76. Riparian areas, playas, floodplains, and wetlands are sensitive. Utilizing them for the development of the oil and gas resource without special consideration causes an unacceptable risk of degradation of their values.

Resource: **Soil and Water**

Stipulation: No Surface Occupancy

Objective: To prevent oil and gas activities from causing landslides and similar massive soil movements, no surface occupancy or use is allowed on the lands described below:

This stipulation is to be applied to the mass wasting potential areas with slopes of or over 60 percent as identified on the Project Map Record for the Oil and Gas Leasing EIS (1:24,000 Soils maps).

In general, larger areas meeting these criteria are located on side slopes of the Rochelle Hills, Miller Hills, Red Hills, HA Divide, Cow Creek Buttes, and portions of the Spring Creek unit. Areas less than 40 acres meeting these criteria are scattered throughout the National Grassland.

Waiver: Waivers will be considered in accordance with the requirements of Title 36 Code of Federal Regulations Part 228. Environmental analysis meeting the requirements of NEPA will be conducted in considering the request. The Deciding Officer's decision will be based on this information.

Exception:	Exceptions will be considered in accordance with the requirements of Title 36 Code of Federal Regulations Part 228. Environmental analysis meeting the requirements of NEPA will be conducted in considering the request. The Deciding Officer's decision will be based on this information.
Modification:	Modifications will be considered in accordance with the requirements of Title 36 Code of Federal Regulations Part 228. Environmental analysis meeting the requirements of NEPA will be conducted in considering the request. The Deciding Officer's decision will be based on this information.
Justification:	LRMP direction, Page III–58, Item c, and page III–59, Items c.1. and c.2. Areas with a classification of "mass wasting potential areas" and with slopes over 60 percent are unstable; using these areas for the development of the oil and gas resource causes an unacceptable risk of massive soil movement.

Current Lease Stipulations under the 2001 Revised LRMP, July 2002 ROD (for the FS lands east of the coal outcrop line)

Resource: **Water, Wetlands, Woody Draws, Riparian, and Floodplains**

Stipulation: Controlled Surface Use

Objective: To protect the biological and hydrologic features, try to locate activities and facilities away from the water's edge and outside the riparian areas, woody draws, wetlands, and floodplains. If necessary to locate facilities in these areas, then:

- Deposit no waste material (silt, sand, gravel, soil, slash, debris, chemical or other material) below high water lines, in riparian areas, in the areas immediately adjacent to riparian areas or in natural drainage ways (draws, land surface depressions or other areas where overland flow concentrates and flows directly into streams or lakes).
- Deposit no soil material in natural drainage ways.
- Locate the lower edge of disturbed or deposited soil banks outside the active floodplain.
- Stockpile no topsoil or any other disturbed soil in the active floodplain.
- Locate drilling mud pits outside riparian areas, wetlands and floodplains. If location is unavoidable in these areas, seal and dike all pits to prevent leakage or use containerized mud systems.

Waivers: This stipulation may be waived if the authorized officer determines the entire leasehold no longer contains any riparian areas, woody draws, wetlands, or floodplains.

Exceptions: The authorizing officer may grant an exception to this stipulation if the operator submits a plan that demonstrates impacts from the proposed action are acceptable or can be adequately mitigated.

Modifications: The boundaries of the stipulated area may be modified if the authorized officer determines that portions of the area do not include riparian areas, woody draws, wetlands, and floodplains.

Justification: A CSU stipulation is needed to ensure minimal effects on riparian areas, woody draws, wetlands, and floodplains. The No Lease option or an NSO stipulation were deemed to be overly restrictive because operations could be conducted in a way that results in minimal effects on riparian areas, woody draws, wetlands, and floodplains.

Resource: Slopes between 25 and 40 Percent (NSO)

Stipulation: No Surface Occupancy

Objective: To protect soil resources from loss of productivity, erosion, mass movement, and resultant sedimentation, surface occupancy and use is prohibited on slopes between 25 – 40 percent with either highly erodible soils or soils susceptible to mass failure.

Waivers: This stipulation may be waived if the authorized officer determines conditions have changed and the entire leasehold no longer contains any highly erodible soils or soils susceptible to mass failure on slopes between 25 to 40 percent in the leasehold.

Exceptions: The authorizing officer may grant an exception to this stipulation if the operator submits a plan that demonstrates impacts from the proposed action are acceptable or can be adequately mitigated.

Modifications: The boundaries of the stipulated area may be modified if the authorizing officer determines that portions of the area do not include slopes between 25 to 40 percent with highly erodible soils or soils susceptible to mass failure.

Justification: A CSU stipulation is needed to ensure minimal effects to soils on steep slopes (between 25 and 40 percent). The No Lease option and NSO stipulation were deemed to be overly restrictive because operations could be conducted in a way that results in minimal effects on soils.

Resource: Slopes Greater than 40 Percent

Stipulation: No Surface Occupancy

Objective: To protect soil resources from loss of productivity and prevent erosion on steep slopes (greater than 40 percent), soil mass movement, and resultant sedimentation.

Waivers: This stipulation may be waived if the authorized officer determines conditions have changed and the entire leasehold no longer contains any slopes greater than 40 percent.

Exceptions: The authorizing officer may grant an exception to this stipulation if the operator submits a plan that demonstrates impacts from the proposed action are acceptable or can be adequately mitigated.

Modifications: The boundaries of the stipulated area may be modified if the authorizing officer determines that portions of the area do not include slopes greater than 40 percent.

Justification: An NSO stipulation is needed to ensure minimal effects on slopes greater than 40 percent. The No Lease option was deemed to be overly restrictive because operations could be conducted in a way that results in minimal effects on slopes greater than 40 percent.

Resource: **Fossils**

Stipulation: Controlled Surface Use

Objective: To protect fossils and the immediate environment of the site, including inherent scientific, natural, historic, interpretive, educational, and recreational values for the area potentially affected.

Waivers: No conditions for a waiver are anticipated, and approval of a waiver would be unlikely.

Exceptions: The authorizing officer may grant an exception to this stipulation if the operator submits a plan that demonstrates impacts from the proposed action are acceptable or can be adequately mitigated.

Modifications: The boundaries of the stipulated area may be modified if the authorizing officer determines that portions of the area do not include significant fossils.

Justification: A CSU stipulation is needed to ensure minimal effects on significant fossils. The No Lease option or a NSO stipulation was deemed to be overly restrictive because operations could be conducted in a way that results in minimal effects on fossils.

Resource: **Ferruginous Hawk and Swainson's Hawk Nests**

Stipulation: Timing Limitation

Objective: To prevent reduced reproductive success, new surface-disturbing activities are prohibited from March 1 through July 31 within 0.5 mile of ferruginous and Swainson's hawk nests.

Waivers: This stipulation may be waived if the authorized officer determines conditions have changed and all nests within the leasehold or within the stipulated distance from the leasehold are known to have been unoccupied during each of the previous 7 years.

Exceptions: The authorizing officer may grant an exception to this stipulation if the operator submits a plan that demonstrates impacts from the proposed action are acceptable or can be adequately mitigated, or if all nests within the leasehold or within the stipulated distance from the leasehold are known to have been unoccupied during each of the previous 7 years.

Modifications: The boundaries of the stipulated area may be modified if the authorizing officer determines that portions of the area include nests or nest site(s) known to have been unoccupied during each of the previous 7 years.

Justification: SLT provide for delay of activities for up to 60 days. Because the critical period extends for about 150 days, the SLT would not be adequate. The No Lease option and NSO stipulation were deemed to be overly restrictive because operations conducted outside the nesting period would have minimal effects on ferruginous and Swainson's hawks.

Resource: Golden Eagle Nests

Stipulation: No Surface Occupancy.

Objective: To prevent reduced reproductive success, new surface-disturbing activities are prohibited from February 1 through July 31 within 0.5 mile (line of sight) of golden eagle nests.

Waivers: This stipulation may be waived if the authorized officer determines conditions have changed and all nests within the leasehold or within the stipulated distance from the leasehold are known to have been unoccupied during each of the previous 7 years.

Exceptions: The authorizing officer may grant an exception to this stipulation if the operator submits a plan that demonstrates impacts from the proposed action are acceptable or can be adequately mitigated, or if all nests within the leasehold or within the stipulated distance from the leasehold are known to have been unoccupied during each of the previous 7 years.

Modifications: The boundaries of the stipulated area may be modified if the authorizing officer determines that portions of the area include nests or nest site(s) known to have been unoccupied during each of the previous 7 years.

Justification: SLT provide for delay of activities for up to 60 days. Because the critical period extends for about 180 days, the SLT would not be adequate. The No Lease option and NSO stipulation were deemed to be overly restrictive because operations conducted outside the nesting period would have minimal effects on golden eagles.

Resource: Merlin Nests

Stipulation: Timing Limitation

Objective: To prevent reduced reproductive success, surface use is prohibited from April 1 through August 15 within 0.5 mile (line of sight) of merlin nests.

Waivers: This stipulation may be waived if the authorized officer determines conditions have changed and all nests within the leasehold or within the stipulated distance from the leasehold are known to have been unoccupied during each of the previous 7 years.

Exceptions: The authorizing officer may grant an exception to this stipulation if the operator submits a plan that demonstrates impacts from the proposed action are acceptable or can be adequately mitigated, or if all nests within the leasehold or within the stipulated distance from the leasehold are known to have been unoccupied during each of the previous 7 years.

Modifications: The boundaries of the stipulated area may be modified if the authorizing officer determines that portions of the area include nests or nest site(s) known to have been unoccupied during each of the previous 7 years.

Justification: SLT provide for delay of activities for up to 60 days. Because the critical period extends for about 140 days, the SLT would not be adequate. The No Lease option and NSO stipulation were deemed to be overly restrictive because operations conducted outside the nesting period would have minimal effects on merlins.

Resource: Sage Grouse Display Grounds

Stipulation: Timing Limitation

Objective: To prevent abandonment of display grounds and reduced reproductive success, surface use is prohibited from March 1 through June 15 within 2 miles (line of sight) of a sage grouse display ground, and noise from production facilities must not exceed 49 decibels (10 dBA above background noise) at the display ground.

Waivers: This stipulation may be waived if the authorized officer determines conditions have changed and all display grounds within the leasehold or within the stipulated distance from the leasehold have not been used during the past five breeding seasons.

Exceptions: The authorizing officer may grant an exception to this stipulation if the operator submits a plan that demonstrates impacts from the proposed action are acceptable or can be adequately mitigated. An exception may be granted if the display ground has not been used by May 1 of the current year.

Modifications: The boundaries of the stipulated area may be modified if the authorizing officer determines that portions of the area do not include any display grounds that have been used during the past five breeding seasons.

Justification: SLT provide for delay of activities for up to 60 days. Because the critical period extends for about 107 days, the SLT would not be adequate. The No Lease option or an NSO were deemed to be overly restrictive because operations conducted outside the nesting period would have minimal effects on the sage grouse.

Resource: **Sharp-tailed Grouse Display Grounds (TL) Stipulation**

Stipulation: Timing Limitation.

Objective: To prevent abandonment of display grounds and reduced reproductive success, surface use is prohibited from March 1 through June 15 within 1 mile (line of sight) of a sharp-tailed grouse display ground.

Waivers: This stipulation may be waived if the authorized officer determines conditions have changed and all display grounds within the leasehold or within the stipulated distance from the leasehold have not been used during the past two breeding seasons.

Exceptions: The authorizing officer may grant an exception to this stipulation if the operator submits a plan that demonstrates impacts from the proposed action are acceptable or can be adequately mitigated. An exception may be granted if the display ground has not been used by May 1 of the current year.

Modifications: The boundaries of the stipulated area may be modified if the authorizing officer determines that portions of the area do not include display grounds that have been used during the last two breeding seasons.

Justification: SLT provide for delay of activities for up to 60 days. Because the critical period extends for about 107 days, the SLT would not be adequate. The No Lease option and NSO stipulation were deemed to be overly restrictive because operations conducted outside the nesting period would have minimal effects on the sharp-tailed grouse.

Resource: **Mountain Plover**

Stipulation: Timing Limitation

Objective: To prevent reduced reproductive success, surface use is prohibited from March 15 through July 31 within 0.25 mile (line of sight) of a mountain plover nests or nest aggregation areas.

Waivers: This stipulation may be waived if the authorized officer determines conditions have changed and there are no nests or nest aggregation areas within the leasehold or within the stipulated distance from the leasehold.

Exceptions: The authorizing officer may grant an exception to this stipulation if the operator submits a plan that demonstrates impacts from the proposed action are acceptable or can be adequately mitigated. An exception may be granted if the nest or nest aggregation area has not been used by June 10 of the current year.

Modifications: The boundaries of the stipulated area may be modified if the authorizing officer determines that portions of the area do not include mountain plover nests and nesting areas.

Justification: SLT provide for delay of activities for up to 60 days. Because the critical period extends for about 140 days, the SLT would not be adequate. The No Lease option and NSO stipulation were deemed to be overly restrictive because operations conducted outside the nesting period would have minimal effects on mountain plovers.

Resource: Swift Fox Dens

Stipulation: Timing Limitation

Objective: To prevent den abandonment and reduced reproductive success, surface use is prohibited from March 1 through August 31 within 0.25 mile (line of sight) of swift fox dens.

Waivers: This stipulation may be waived if the authorized officer determines conditions have changed and there are no dens within the leasehold or within the stipulated distance from the leasehold.

Exceptions: The authorizing officer may grant an exception to this stipulation if the operator submits a plan that demonstrates impacts from the proposed action are acceptable or can be adequately mitigated.

Modifications: The boundaries of the stipulated area may be modified if the authorizing officer determines that portions of the area do not include swift fox dens.

Justification: SLT provide for delay of activities for up to 60 days. Because the critical period extends for about 180 days, the SLT would not be adequate. The No Lease option and NSO stipulation were deemed to be overly restrictive because operations conducted outside the denning period would have minimal effects on swift foxes.

Resource: Mountain Plover Habitat

Stipulation: Controlled Surface Use

Objective: To prevent reductions in reproductive success, operations in mountain plover nesting and brooding habitat are subject to the following constraints:

- Limit oil and gas development to no more than one location per 80 acres.
- Suitable mountain plover habitat lost because of new facilities must be replaced within 1 year.
- Access for routine maintenance of oil and gas facilities in mountain plover nesting and brooding habitat will be between 9 a.m. and 5 p.m. This does not apply to emergency repairs.

- ➢ If it is necessary to place a new road in a prairie dog colony, align the road to minimize habitat loss.

Waivers: No conditions for a waiver are anticipated, and approval of a waiver would be unlikely.

Exceptions: No conditions for an exception are anticipated, and approval of an exception would be unlikely.

Modifications: The boundary of the stipulated area may be modified if the authorizing officer determines that portions of the area do not contain active prairie-dog colonies.

Justification: A CSU stipulation is needed to ensure minimal effects on mountain plover habitat. The No Lease option and NSO stipulation were deemed to be overly restrictive because operations could be conducted in a way that results in minimal effects on mountain plovers.

Resource: Mountain Plover Nests and Nesting Areas

Stipulation: No Surface Occupancy

Objective: To prevent reduced reproductive success and adverse habitat loss, no surface occupancy or use is allowed within 0.25 miles of known mountain plover nests or nesting areas.

Waivers: No conditions for a waiver are anticipated, and approval of a waiver would be unlikely.

Exceptions: No conditions for an exception are anticipated, and approval of an exception would be unlikely.

Modifications: The boundary of the stipulated area may be modified if the authorizing officer determines that portions or the area do not contain active black-tailed prairie dogs colonies.

Justification: An NSO stipulation is needed to ensure minimal effects on mountain plover nests and nesting areas. The No Lease option was deemed to be overly restrictive because operations could be conducted in a way that results in minimal effects on mountain plover nests and nesting areas.

Resource: Bald Eagle Nests

Stipulation: No Surface Occupancy

Objective: To prevent reduced reproductive success and adverse habitat loss, no surface occupancy or use is allowed within 1 mile (line of sight) of bald eagle nests.

Waivers: This stipulation may be waived if the authorized officer determines conditions have changed and all nests within the leasehold or within the stipulated distance from the leasehold are known to have been unoccupied during each of the previous 7 years.

Exceptions:	The authorizing officer may grant an exception to this stipulation if the operator submits a plan that demonstrates impacts from the proposed action are acceptable or can be adequately mitigated.
Modifications:	The boundaries of the stipulated area may be modified if the authorizing officer determines that portions of the area include nests or nest site(s) known to have been unoccupied during each of the previous 7 years. The boundary of the stipulated area may also be modified if the authorized officer determines that portions of the area can be occupied without adversely affecting the eagles.
Justification:	An NSO stipulation is needed to ensure minimal effects on bald eagle nests. The No Lease option was deemed to be overly restrictive because operations could be conducted in a way that results in minimal effects on bald eagle nests.
Resource:	**Bald Eagle Winter Roosts**
Stipulation:	No Surface Occupancy
Objective:	To prevent abandonment of winter roost, no surface occupancy or use is allowed within 1.0 mile (line of sight) of bald eagle roosting areas.
Waivers:	This stipulation may be waived if the authorized officer determines conditions have changed and winter roosting areas are no longer used within the leasehold or within the stipulated distance from the leasehold.
Exceptions:	The authorizing officer may grant an exception to this stipulation if the operator submits a plan that demonstrates impacts from the proposed action are acceptable or can be adequately mitigated.
Modifications:	The boundaries of the stipulated area may be modified if the authorizing officer determines that portions of the area do not include winter roosting areas. The boundary of the stipulated area may also be modified if the authorized officer determines that portions of the area can be occupied without adversely affecting the eagles.
Justification:	An NSO stipulation is needed to ensure minimal effects on bald eagle winter roosts. The No Lease option was deemed to be overly restrictive because operations could be conducted in a way that results in minimal effects on bald eagle winter roosts.
Resource:	**Golden Eagle, Merlin, Ferruginous Hawk, Swainson's Hawk, and Burrowing Owl Nests**
Stipulation:	No Surface Occupancy
Objective:	To prevent reduced reproductive success and adverse habitat loss, no surface occupancy or use is allowed within 0.25 mile

(line-of-sight) of golden eagle, merlin, ferruginous hawk, Swainson's hawk, or burrowing owl nests.

Waivers: This stipulation may be waived if the authorized officer determines conditions have changed and all nests within the leasehold or within the stipulated distance from the leasehold are known to have been unoccupied during each of the previous 7 years.

Exceptions: The authorizing officer may grant an exception to this stipulation if the operator submits a plan that demonstrates impacts from the proposed action are acceptable or can be adequately mitigated.

Modifications: The boundaries of the stipulated area may be modified if the authorizing officer determines that portions of the area include nests or nest site(s) known to have been unoccupied during each of the previous 7 years. The boundary of the stipulated area may also be modified if the authorized officer determines that portions of the area can be occupied without adversely affecting these raptors.

Justification: An NSO stipulation is needed to ensure minimal effects on golden eagle, merlin, ferruginous hawk, Swainson's hawk, and burrowing owl nests. The No Lease option was deemed to be overly restrictive because operations could be conducted in a way that results in minimal effects on golden eagle, merlin, ferruginous hawk, Swainson's hawk, and burrowing owl nests.

Resource: Sharp-tailed Grouse and Sage Grouse Display Grounds

Stipulation: No Surface Occupancy

Objective: To prevent abandonment of display grounds, reduced reproductive success, and adverse habitat loss, no surface occupancy or use is allowed within 0.25 mile (line of sight) of a sharp-tailed grouse or sage grouse display ground.

Waivers: This stipulation may be waived if the authorized officer determines conditions have changed and all display grounds within the leasehold or within the stipulated distance of the leasehold have not been used during the last two breeding seasons (sharp-tailed grouse) or five breeding seasons (sage grouse).

Exceptions: The authorizing officer may grant an exception to this stipulation if the operator submits a plan that demonstrates impacts from the proposed action are acceptable or can be adequately mitigated.

Modifications: The boundaries of the stipulated area may be modified if the authorizing officer determines that portions of the area do not include any display grounds that have been used during the last two breeding seasons (sharp-tailed grouse) or five breeding seasons (sage grouse). The boundary of the stipulated area may also be modified if the authorized officer determines that portions of the area can be occupied without adversely affecting sage grouse and the display grounds.

Justification: An NSO stipulation is needed to ensure minimal effects on sharp-tailed grouse or sage grouse display grounds. The No Lease option was deemed to be overly restrictive because operations could be conducted in a way that results in minimal effects on sharp-tailed grouse or sage grouse display grounds.

Resource: Moderate Scenic Integrity Objective (SIO) Areas

Stipulation: Controlled Surface Use

Objective: To maintain the scenic integrity objective (SIO) for areas identified as moderate, surface occupancy and use are subject to operational constraints to maintain a landscape character that is no more than slightly altered. Noticeable deviations must remain visually subordinate to the landscape character being viewed.

Waivers: No conditions for a waiver are anticipated, and approval of a waiver is unlikely.

Exceptions: No conditions for an exception are anticipated, and approval of an exception is unlikely.

Modifications: The boundaries of the stipulated area may be modified if the authorizing officer determines that portions of the area do not include moderate SIO areas.

Justification: A CSU stipulation is needed to ensure minimal effects on moderate scenic integrity objective areas. The No Lease option and NSO stipulation were deemed to be overly restrictive because operations could be conducted in a way that results in minimal effects on moderate scenic integrity objective areas.

Resource: Black-footed Ferret Habitat

Stipulation: Timing Limitation

Objective: To protect black-footed ferrets when breeding and rearing young, surface use is prohibited from March 1 through August 31 within 0.125 mile (line of sight) of prairie dog colonies occupied or thought to be occupied by black-footed ferrets.

Waivers: The authorized officer may grant a waiver if ferret surveys, following protocol approved by the FWS, indicate a low probability that ferrets occur in prairie dog colonies located in the leasehold or if the FWS determines that black-footed ferrets do not occur in the area.

Exceptions: The authorizing officer may grant an exception to this stipulation if the operator submits a plan that demonstrates impacts from the proposed action are acceptable or can be adequately mitigated. An exception may be granted if surveys indicate a low probability that ferrets occur in a prairie dog colony where drilling, testing, or new construction is proposed.

Modifications: The boundaries of the stipulated area may be modified if the authorizing officer determines that black-footed ferrets do not occur in portions of the area.

Justification: SLT provide for delay of activities for up to 60 days. Because the critical period extends for about 182 days, the SLT would not be adequate. The No Lease option and NSO stipulation were deemed to be overly restrictive because operations conducted outside the critical winter period would have minimal effects on black-footed ferrets breeding and rearing young.

Resource: Black-footed Ferret Habitat

Stipulation: Controlled Surface Use

Objective: To prevent adverse impacts to black-footed ferrets or ferret recovery objectives, operations in prairie dog colonies known or thought to be occupied by black-footed ferrets are subject to the following constraints:

- Limit oil and gas development to no more than one location per 80 acres.
- Suitable black-footed ferret habitat lost as a result of new facilities within prairie dog colonies must be replaced within 1 year.
- Access for routine maintenance of oil and gas facilities in prairie dog colonies is limited to daylight hours. This does not apply to emergency repairs.
- If it is necessary to place a new road in a prairie dog colony, align the road to minimize habitat loss.

Waivers: The authorized officer may waive this stipulation if black-footed ferrets are released under an experimental non-essential population status; this stipulation may be waived for areas inside the experimental population area but outside Management Area 3.63.

Exceptions: No conditions for an exception are anticipated, and approval of an exception is unlikely.

Modifications: No conditions for a modification are anticipated, and approval of a modification is unlikely.

Justification: A CSU stipulation is needed to ensure minimal effects on black-footed ferrets or ferret recovery objectives. The No Lease option and NSO stipulation were deemed to be overly restrictive because operations could be conducted in a way that results in minimal effects on black-footed ferrets or ferret recovery objectives.

Resource: Black-footed Ferret Reintroduction Habitat

Stipulation: Controlled Surface Use

Objective: To preserve black-footed ferret habitat (Management Area 3.63), operations in all prairie dog colonies are subject to the following constraints:

- Limit oil and gas development to no more than one location per 80 acres.
- Suitable black-footed ferret habitat lost as a result of new facilities within prairie dog colonies must be replaced within 1 year.
- Access for routine maintenance of oil and gas facilities in prairie dog colonies is limited to daylight hours. This does not apply to emergency repairs.
- If it is necessary to place a new road in a prairie dog colony, align the road to minimize habitat loss.

Waivers: No conditions for a waiver are anticipated, and approval of a waiver is unlikely.

Exceptions: No conditions for an exception are anticipated, and approval of an exception is unlikely.

Modifications: No conditions for a modification are anticipated, and approval of a modification is unlikely.

Justification: A CSU stipulation is needed to ensure minimal effects on black-footed ferret reintroduction habitat. The No Lease option and NSO stipulation were deemed to be overly restrictive because operations could be conducted in a way that results in minimal effects on black-footed ferret reintroduction habitat.

Resource: Deer, Elk, and Pronghorn Habitat

Stipulation: Timing Limitation

Objective: To avoid adversely impacting big game winter range, surface use is prohibited from December 15 through March 15 of each year on identified winter range for deer, elk, or pronghorn.

Waivers: No conditions for a waiver are anticipated, and approval of a waiver is unlikely.

Exceptions: The authorizing officer may grant an exception to this stipulation if the operator submits a plan that demonstrates impacts from the proposed action are acceptable or can be adequately mitigated.

Modifications: The boundaries of the stipulated area may be modified if the authorizing officer determines that portions of the area do not include winter range.

Justification: SLT provide for delay of activities for up to 60 days. Because the critical period extends for about 89 days, the SLT would not be adequate. The No Lease option and NSO stipulation were deemed to be overly restrictive because operations conducted outside the critical winter period would have minimal effects on deer, elk, or pronghorn winter survival.

Resource: **Elk Calving**

Stipulation: Timing Limitation

Objective: To avoid adversely impacting calving areas during parturition, surface use is prohibited from May 1 through June 31 of each year on identified elk calving areas.

Waivers: No conditions for a waiver are anticipated, and approval of a waiver would be unlikely.

Exceptions: The authorizing officer may grant an exception to this stipulation if the operator submits a plan that demonstrates impacts from the proposed action are acceptable or can be adequately mitigated.

Modifications: The boundaries of the stipulated area may be modified if the authorizing officer determines that portions of the area do not include elk calving areas.

Justification: SLT provide for delay of activities for up to 60 days. Because the critical period extends for about 61 days, the SLT would not be adequate. The No Lease option and NSO stipulation were deemed to be overly restrictive because operations conducted outside the calving period would have minimal effects on elk reproduction.

Review of the Lease Notices and Stipulations for the Preferred Alternative

Buffalo Field Office Area

Based on review of the information documented in the FEIS, there is no need to modify any of the above lease notices or lease stipulations or develop any new lease notices or lease stipulations to implement the Preferred Alternative. The resource management objectives and protective measures to be accomplished through application of the current lease notices and lease stipulations would still be achievable with the analyzed level of oil and gas development. The social, environmental and economic effects as described in the FEIS were determined based on consideration of the continued use of these lease notices and stipulations. Implementation of the Preferred Alternative would not preclude effective use of the lease notices and lease stipulations.

Casper Field Office Area

Based on review of the information documented in the FEIS, there is no need to modify any of the above lease notices or lease stipulations or develop any new lease notices or lease stipulations to implement the Preferred Alternative. The resource management objectives and protective measures to be accomplished through application of the current lease notices and lease stipulations would still be achievable with the analyzed level of oil and gas development. The social, environmental and economic effects as described in the FEIS were determined based on consideration of the continued use of these lease notices and stipulations. Implementation of the Preferred Alternative would not preclude effective use of the lease notices and lease stipulations.

Thunder Basin National Grassland

Based on review of the information documented in the FEIS, there is no need to modify any of the above lease notices or lease stipulations or develop any new lease notices or lease stipulations to implement the Preferred Alternative. This analysis did not identify a need to modify or add any lease stipulations to the 2001 Revised TBNG LRMP in order to implement the Preferred Alternative Within the analyzed level of oil and gas development, resource management objectives for the TBNG LRMP will be achieved. Unique aspects of CBM will be adequately mitigated using COA and existing lease stipulations, lease notices, and current land use allocations in the 2001 Revised TBNG LRMP.

Appendix Q
Review of Land Use Plan Decisions Against the Effects of the Preferred Alternative

Appendix Q — Review of Land Use Plan Decisions Against the Effects of the Preferred Alternative

BLM

Changes would only be necessary if implementing any aspect of the Preferred Alternative would result in social, environmental or economic effects that would preclude accomplishment of one or more of the RMP objectives. In such a situation, BLM would have to determine if the precluded RMP objectives should be changed through the plan amendment process to accommodate the oil and gas objectives or if oil and gas objectives should be changed to accomplish the other RMP objectives.

Buffalo RMP

RMP Objectives/decisions	Evaluation	Determination
Cultural Resources		
➢ Protect, preserve, interpret, and manage significant cultural resources for their informational, educational, scientific, and recreational values.	Significant cultural resources can be protected with lease notices, standard lease terms and conditions or with COA attached to the APD	Based on the analysis described in the FEIS, implementing the Preferred Alternative does not preclude implementation of the decision and accomplishment of the objectives. BLM has adequate authority and reasonable mitigation measures will be applied as needed.
➢ Bozeman trail: To preserve historic values on significant trail segments on BLM-administered public surface and to preserve such values on other segments when affected by federal minerals development.	The Bozeman Trail can be protected with existing stipulations or with COA attached to the APD.	
➢ The Crazy Woman battle site will be managed to preserve the historic values at the site and to develop cooperative interpretation in partnership with the Wyoming State Parks and Historic Sites. Future management actions include planning and developing an interpretive site and periodic monitoring.	The Crazy Woman battle site can be protected with existing stipulations or with COA attached to the APD.	
➢ Cantonment Reno will be managed to preserve significant historic remains and scientific potential, to promote historic research, and to develop an interpretation area to protect and enhance the visitor's awareness of the history of the area.	The Cantonment Reno site can be protected with existing stipulations or with COA attached to the APD.	

RMP Objectives/decisions	Evaluation	Determination
➢ Site-specific inventories for cultural resources are required before any surface disturbing activities can begin. Adverse effects on significant resources are mitigated, or the resources themselves are avoided. Sites listed on, or eligible for, the National Register of Historic Places (NRHP) are protected.	FEIS acknowledges that inventories will be conducted prior to surface disturbance.	
Lands and Realty		
➢ Locate transmission lines and transportation facilities to the extent feasible within identified corridors	The FEIS does not authorize specific transmission lines, pipelines or roads. Use of corridors for these facilities will be considered during the permit process to the extent feasible	Based on the analysis described in the FEIS, implementing the Preferred Alternative does not preclude implementation of the decision and accomplishment of the objectives.
Geology and Mineral Resources		
➢ Maintain or enhance opportunities for mineral exploration and development while maintaining other resource values.	The FEIS evaluates a proposal to develop federal leases. Such an action is in conformance with these management decisions and objectives, though significant mineral resources are currently unavailable for development and thus may not be efficiently used at this time. Some new conditions of use (mitigation measures) have been implemented since the 1985 RMP. The Proposed Plan Amendments do not include changes to the leasing allocation decisions, as the FEIS does not address leasing.	The RMP should be amended to allow oil and gas exploration and development at the level analyzed in the FEIS to make more efficient use of the mineral resource and to adopt current conditions of use.
➢ BLM will provide for the efficient use of the mineral resource.		
➢ Continue to lease and allow development of federal oil and gas in the Buffalo Field Office Area.		
Air quality		
➢ Maintain or enhance air quality, protect public health and safety and sensitive natural resources, and minimize emissions that could result in acid rain, violations of air quality standards, or reduced visibility.	The FEIS includes a detailed analysis of air quality impacts, identifies mitigation options and considers two methods to reduce emissions from compressor stations.	Permitting agencies have adequate authority and reasonable mitigation measures will be applied as needed. As long as conditions of use are required as necessary, the impacts from the level of oil and gas

RMP Objectives/decisions	Evaluation	Determination
➢ Any BLM-initiated actions or authorizations that result in air quality or visibility deterioration are conditioned to avoid violating Wyoming and national air quality standards. This is done through coordinating BLM-managed activities with the Wyoming Department of Environmental Quality (WDEQ) and the U.S. Environmental Protection Agency (EPA).	The FEIS acknowledges that, as part of the permit approval process, the air quality regulatory agencies would prepare additional analysis, conduct monitoring and require mitigation as needed to ensure compliance with all applicable standards before permits would be approved.	operations analyzed in the FEIS would not preclude implementation of the decision and accomplishment of the objectives.
➢ Dust control measures are required to be taken to increase visibility and reduce particulate impacts for all construction and other surface-disturbing activities. Air quality standards are monitored by the WDEQ.	The FEIS includes an analytical assumption that some control of fugitive dust will be achieved during construction, but that control of all fugitive dust may not be achievable. Dust control measures would be considered during the permitting process and required where necessary to ensure compliance with the applicable standards.	The current decision includes an across the board dust control requirement that is independent of air quality standards and the roles and responsibilities of the permitting agencies. Dust control measures are more appropriately considered as mitigation options (see Chapter 4, FEIS). That part of the decision should be deleted from the RMP by amendment.
Recreation		
➢ Provide outdoor recreational opportunities on BLM administered public land while providing for resource protection, visitor services, and the health and safety of public land visitors.	The FEIS documents the effects of oil and gas development on recreation resources. Lands with special recreation values would still be protected by a NSO stipulation.	BLM has adequate authority and reasonable mitigation measures will be applied as needed. Based on the analysis described in the FEIS, implementing the Preferred Alternative does not preclude implementation of the decision and accomplishment of the objectives.
➢ Prohibit surface disturbance or occupancy in the Red Wall/Hole in the Wall area, within the Middle Fork Canyon and within ½ mile of the Dry Creek Petrified Tree area.		
Visual Resources		
➢ Maintain or improve scenic values, visual quality, and establish visual resource management priorities in conjunction with other resource values.	The FEIS documents the effects of the proposed action on visual resources. The management decision for visual resources provides for management in accordance with the VRM objectives, which will be considered when making site-specific decisions about roads, pads and related facilities.	While BLM has the authority to protect state and federal highways per the lease notice, the RMP should more clearly identify BLM's objectives on this matter. This objective should be considered for specific state and federal highways as a lease stipulation or CSU or COA in a subsequent RMP amendment.
➢ Visual resources are managed in accordance with objectives for visual resource management (VRM) classes that have been assigned to the planning area. No activity or occupancy is allowed within 200 feet of the edge of state and federal highways.	The FEIS describes lease notice #1, which gives BLM authority	BLM has adequate authority and reasonable mitigation measures will

RMP Objectives/decisions	Evaluation	Determination
➢ Facilities or structures such as power lines, oil wells, and storage tanks are required to be screened, painted, and designed to blend with the surrounding landscape except where safety indicates otherwise. Any facilities or structures proposed in or near WSAs will be designed so as not to impair wilderness suitability.	to protect certain resources, including state and federal highways.	be applied as needed. Based on the analysis described in the FEIS, implementing the Preferred Alternative does not preclude implementation of the decision and accomplishment of the objectives.
Water Resources		
➢ Maintain or improve surface and groundwater quality consistent with existing and anticipated uses and applicable state and federal water quality standards.	The FEIS includes a detailed analysis of water quality impacts, identifies mitigation options and considers alternative water handling methods to reduce water quality impacts. The FEIS describes lease notice #1, which gives BLM authority to protect certain resources, including surface water and/or riparian areas. The FEIS acknowledges that, as part of the permit approval process, the water quality regulatory agencies would conduct monitoring and require mitigation as needed to ensure compliance with all applicable standards before permits would be approved. All potential exceedences of the established water quality standards would be avoided in this manner.	Permitting agencies have adaquate authority and reasonable mitigation measures will be applied as needed. Based on the analysis described in the FEIS, implementing the Preferred Alternative does not preclude implementation of the decision and accomplishment of the objectives.
➢ Provide for availability of water to facilitate authorized uses, and to minimize harmful consequences of erosion and surface runoff from BLM-administered public land.		
Soil Resources		
➢ Maintain soil cover and productivity and provide for improvement in areas where soil productivity may be below potential on BM-administered public land surface.	The FEIS includes an analysis of impacts to soils, identifies mitigation measures and includes stipulations to protect soil resources, such as severe erosion hazard areas and water sources.	BLM has adequate authority and reasonable mitigation measures will be applied as needed. Based on the analysis described in the FEIS, implementing the Preferred Alternative does not preclude implementation of the decision and accomplishment of the objectives.
➢ Prohibit surface disturbance or occupancy within areas of severe erosion hazard from March 1 through June 15.		
➢ Prohibit surface disturbance within 500' of any spring, reservoir, water well or perennial stream.		

RMP Objectives/decisions	Evaluation	Determination
Livestock Grazing		
➢ Maintain or improve forage production and range condition to provide a sustainable resource base for livestock grazing on the public lands while improving wildlife habitat and watershed.	The FEIS includes an analysis of the impacts to livestock uses. Overall, the impacts to livestock uses would not likely affect the availability of land and forage for livestock use.	Based on the analysis described in the FEIS, implementing the Preferred Alternative does not preclude implementation of the decision and accomplishment of the objectives.
Paleontology resources		
➢ Manage paleontological resources that are part of the BLM administered public land surface estate for their informational, educational, scientific, public, and recreational uses.	The FEIS includes an analysis of impacts to paleontological resources. Significant resources can be protected with lease notices, standard lease terms and conditions or with COA attached to the APD.	BLM has adequate authority and reasonable mitigation measures will be applied as needed. Based on the analysis described in the FEIS, implementing the Preferred Alternative does not preclude implementation of the decision and accomplishment of the objectives.
Threatened, Endangered, and Candidate Species Protection		
➢ Maintain biological diversity of plant and animal species.	The FEIS includes an analysis of impacts to these species. The Biological Opinion (BO) issued by the US Fish and Wildlife Service concludes that the development of oil and gas resources to the level analyzed in the FEIS would not jeopardize these species if the conditions described in the BO are satisfied.	BLM has adequate authority and reasonable mitigation measures will be applied as needed. Based on the analysis described in the FEIS, implementing the Preferred Alternative does not preclude implementation of the decision and accomplishment of the objectives.
➢ Support WGFD strategic plan population objective levels to the extent practical and to the extent consistent with BLM multiple use management requirements.		
➢ Maintain, and where possible, improve forage production and quality of rangelands, fisheries, and wildlife habitat.		
➢ To the extent possible, provide habitat for threatened and endangered and special status plant and animal species on all public lands in compliance with the Endangered Species Act (ESA) and approved recovery plans.		
Sensitive Plants		
➢ Maintain biological diversity of plant and animal species.	The FEIS includes an analysis of impacts to these species and	BLM has adequate authority and reasonable mitigation measures will

RMP Objectives/decisions	Evaluation	Determination
➢ Support WGFD strategic plan population objective levels to the extent practical and to the extent consistent with BLM multiple use management requirements.	resource values. A special Lease Notice provides BLM authority to protect special status species of plants and animals. These objectives will be further considered during the subsequent NEPA analysis to be conducted prior to permit approval of wells and related facilities. BLM will apply mitigation as COA to help meet these goals.	be applied as needed. Based on the analysis described in the FEIS, implementing the Preferred Alternative does not preclude implementation of the decision and accomplishment of the objectives.
➢ Maintain, and where possible, improve forage production and quality of rangelands, fisheries, and wildlife habitat		
➢ To the extent possible, provide habitat for threatened and endangered and special status plant and animal species on all public lands in compliance with the Endangered Species Act (ESA) and approved recovery plans.		
Wildlife Habitat Management		
➢ Maintain biological diversity of plant and animal species.	The FEIS includes an analysis of impacts to these species and values. These objectives will be further considered during the subsequent NEPA analysis to be conducted prior to permit approval of wells and related facilities. BLM will apply mitigation as COA to help meet these goals.	BLM has adequate authority and reasonable mitigation measures will be applied as needed. Based on the analysis described in the FEIS, implementing the Preferred Alternative does not preclude implementation of the decision and accomplishment of the objectives.
➢ Support WGFD strategic plan population objective levels to the extent practical and to the extent consistent with BLM multiple use management requirements.		
➢ Maintain, and where possible, improve forage production and quality of rangelands, fisheries, and wildlife habitat.		
➢ To the extent possible, provide habitat for threatened and endangered and special status plant and animal species on all public lands in compliance with the Endangered Species Act (ESA) and approved recovery plans.		

RMP Objectives/decisions	Evaluation	Determination
Riparian Areas		
➢ Riparian areas and wetlands in less than proper functioning condition will be improved. The goal is to create, improve, or maintain existing riparian and wetland areas for waterfowl such as ducks, geese, and shorebirds; warm- and cold-water fish; and other wildlife species that depend on these areas for their health and well being.	The FEIS includes an analysis of impacts to these resource values. These objectives will be further considered during the subsequent NEPA analysis to be conducted prior to permit approval of wells and related facilities. BLM will apply mitigation as COA to help meet these goals.	BLM has adequate authority and reasonable mitigation measures will be applied as needed. Based on the analysis described in the FEIS, implementing the Preferred Alternative does not preclude implementation of the decision and accomplishment of the objectives.

Conclusion for Buffalo RMP: BLM has carefully reviewed Chapter 4 relative to the current land use plan objectives for the BFO and determined that with the current stipulations and new mitigation measures, the Preferred Alternative would not result in any social, environmental or economic effects that would preclude accomplishment of one or more of the RMP objectives as long as appropriate conditions of use are required. BLM and permitting agencies have adequate authority and reasonable mitigation measures will be applied as needed. Thus, changes to the RMP objectives are not warranted though a change in the RMP to allow oil and gas exploration and development at the level analyzed in the FEIS to make more efficient use of the mineral resource, and to adopt current conditions of use is appropriate.

Platte River RMP

RMP Objectives/decisions	Evaluation	Determination
Cultural Resources		
➢ Cultural resource management will focus on the historic Bozeman Trail and several stage stations along its route. The trail segments will be protected through ORV closures and prohibition of surface disturbance.	The Bozeman Trail can be protected with existing stipulations or with COA attached to the APD.	BLM has adequate authority and reasonable mitigation measures will be applied as needed. Based on the analysis described in the FEIS, implementing the Preferred Alternative does not preclude implementation of the decision and accomplishment of the objectives.
➢ Bozeman Trail - No surface development will be permitted on the certain parcels (refer to the Platte River RMP for details) along the Bozeman Trail in Converse County (1,030 acres). Each trail segment in C3 has been individually evaluated according to the "Guidelines for the Evaluation of Historical Wagon Trails" of the Casper District and Wyoming State Office, BLM. Trail segments that may be located will be protected until their significance is evaluated		
Energy and Mineral Resources		
➢ Continue to lease and allow development of	The FEIS evaluates a	The RMP should be

RMP Objectives/decisions	Evaluation	Determination
federal oil and gas in the Buffalo Field Office Area.	proposal to develop federal leases. Such an action is in conformance with the management decision and objectives, though significant mineral resources are currently unavailable for development and thus may not be efficiently used at this time. Some new conditions of use (mitigation measures) have been implemented since the 1985 RMP. The Proposed Plan Amendments do not include changes to the leasing allocation decisions, as the FEIS does not address leasing.	amended to allow oil and gas exploration and development at the level analyzed in the FEIS to make more efficient use of the mineral resource and to adopt current conditions of use.
Weed and Pest Control		
➢ We will continue the existing weed and grasshopper control programs.	The FEIS includes an analysis of impacts to vegetation, including noxious weeds. Reclamation measures, to be applied as COA are also discussed. This decision simply acknowledges BLM's intent to continue actions to control weeds and grasshoppers, which occur as a result of many factors, many beyond the scope of the FEIS. No specific objectives have been identified.	BLM has adequate authority and reasonable mitigation measures will be applied as needed. Based on the analysis described in the FEIS, implementing the Preferred Alternative does not preclude implementation of the decision.
Visual Resource Management		
➢ The BLM's visual resource management (VRM) system will be applied in the PRRA where required to mitigate impacts from surface development.	The FEIS documents the effects of the proposed action on visual resources. Visual resources will be considered when making site-specific decisions about roads, pads and related facilities and mitigated based on a site-specific analysis.	BLM has adequate authority and reasonable mitigation measures will be applied as needed. Based on the analysis described in the FEIS, implementing the Preferred Alternative does not preclude implementation of the decision and accomplishment of the

RMP Objectives/decisions	Evaluation	Determination
		objectives.
Black-footed Ferret Habitat		
➢ No surface development will be allowed within prairie dog towns until it is determined that a development proposal will not adversely affect the black-footed ferret. Such determination will be made through a biological assessment by the BLM or through consultation with the USFWS under Section 7 of the ESA.	The FEIS includes an analysis of impacts to special status species. The Biological Opinion (BO) issued by the US Fish and Wildlife Service concludes that the development of oil and gas resources to the level analyzed in the FEIS would not jeopardize these species if the conditions described in the BO are satisfied.	BLM has adequate authority and reasonable mitigation measures will be applied as needed. Based on the analysis described in the FEIS, implementing the Preferred Alternative does not preclude implementation of the decision and accomplishment of the objectives.
Wildlife		
➢ Wildlife management will stress continued monitoring of sage grouse strutting grounds and case-by-case implementation of stipulations on rights-of-way and proposed mineral activity to protect important habitat. We will continue to check prairie dog towns for ferrets and burrowing owls, since the Ross Management Unit has high potential for these species.	The FEIS includes an analysis of impacts to these species and values. These objectives will be further considered during the subsequent NEPA analysis to be conducted prior to permit approval of wells and related facilities. BLM will apply mitigation as COA to help meet these goals.	BLM has adequate authority and reasonable mitigation measures will be applied as needed. Based on the analysis described in the FEIS, implementing the Preferred Alternative does not preclude implementation of the decision and accomplishment of the objectives.
Soil, Water, and Air		
➢ The level of soil, water and air management for this unit will be low except for application of resource protection stipulations on historic segments. Decisions that constrain development may be implemented case by case in the rest of the unit.	The FEIS includes an analysis of impacts to soil, water, and air quality. It identifies mitigation measures and includes stipulations to protect soil resources, water sources and quality and air resources.	BLM and permitting agencies have adequate authority and reasonable mitigation measures will be applied as needed. Based on the analysis described in the FEIS, implementing the Preferred Alternative does not preclude implementation of the decision and accomplishment of the objective.
➢ For the protection of surface water, surface development will be prohibited in the following areas: within ¼ mile of the North Platte River; within 500 feet of live streams, lakes, reservoirs, and canals and associated	This protection measure is attached to leases under LN #1.	Permitting agencies have adequate authority and reasonable mitigation measures will be applied as needed. Based on the

RMP Objectives/decisions	Evaluation	Determination
riparian habitat; and within 500 feet of water wells, springs, or artesian and flowing wells.		analysis described in the FEIS, implementing the Preferred Alternative does not preclude implementation of the decision and accomplishment of the objectives.
Slope Restrictions		
➢ No occupancy or other surface disturbance is allowed on slopes of more than 25 percent without permission from the authorized officer. When development is proposed on slopes of more than 25 percent, engineered drawings for construction, drainage design, and final contours proposed after rehabilitation will be required. No occupancy will be allowed on slopes over 25 percent in the South Bighorns.	This restriction is attached to leases under LN #1.	BLM has adequate authority and reasonable mitigation measures will be applied as needed. Based on the analysis described in the FEIS, implementing the Preferred Alternative does not preclude implementation of the decision and accomplishment of the objectives.

Conclusion for Platte River RMP: BLM has carefully reviewed Chapter 4 relative to the current land use plan objectives for the CFO and determined that with the current stipulations and new mitigation measures, the Preferred Alternative would not result in any social, environmental or economic effects that would preclude accomplishment of one or more of the RMP objectives as long as appropriate conditions of use are required. BLM and permitting agencies have adequate authority and reasonable mitigation measures will be applied as needed. Thus, changes to the RMP objectives are not warranted though a change in the RMP to allow oil and gas exploration and development at the level analyzed in the FEIS and to adopt current conditions of use is appropriate.

FS

Thunder Basin National Grassland LRMP

On July 31, 2002 a ROD for the FEIS and LRMP Revision for the TBNG was issued making the Revised 2001 Plan effective. Goals, Objectives, Standards, and Guidelines in the 2001 Plan apply to all activities on the TBNG; some are particular to oil and gas leasing. Goals and Objectives, which relate particularly to oil and gas leasing, are as follows:

- Goal 1.a: Objective 5. Throughout the life of the LRMP, ensure proper plugging of abandoned wells to prevent cross contamination of aquifers (for example, seismograph holes, water wells, etc.).
- Goal 2.b: Mineral and Energy Resources Objective 1. Ensure reclamation provisions of operating plans are completed to standard.

- Goal 2.b: Mineral and Energy Resources Objective 2. Honor all valid existing legal mineral rights.

Grassland-wide Standards and Guidelines, which resulted in oil and gas leasing stipulations, are as follows:

- B. Water: number 14. Locate activities and facilities away from the water's edge or outside the riparian areas, woody draws, wetlands, and floodplains unless alternatives have been assessed and determined to be more environmentally damaging. If it is necessary to locate activities or facilities in these areas, then:

- Deposit no waste material (silt, sand, gravel, soil, slash, debris, chemical, or other material) below high-water lines, in riparian areas, in the areas immediately adjacent to riparian areas or in natural drainage ways (draws, land surface depressions or other areas where overland flow concentrates and flows directly into streams or lakes).
- Prohibit deposition of soil material in natural drainage ways.
- Locate the lower edge of disturbed or deposited soil banks outside the active floodplain.
- Prohibit stockpiling of topsoil or any other disturbed soil in the active floodplain.
- Locate drilling mud pits outside riparian areas, wetlands, and floodplains. If location is unavoidable in these areas, seal and dike all pits to prevent leakage.
- Rehabilitate gravel pits, if located in riparian zones, to simulate a natural riparian/aquatic situation. **Guideline**

- C. Soils: number 4. Prohibit soil-disturbing activities (for example, road construction, well pad construction) on slopes greater than 40 percent and on soils susceptible to mass failure. **Guideline**
- E. Paleontological Resources: number 1. Protect key paleontological resources (Classes 3, 4, and 5 of the Fossil Potential Classification) from disturbance, or mitigate the effects of disturbance, to conserve scientific, interpretive, and legacy values. **Standard**
- E. Paleontological Resources: number 3. Prior to ground-disturbing activities, conduct paleontological surveys in any area where there is a high potential to encounter these resources according to the process outlined in Appendix J. **Standard**
- F. Fish, Wildlife, and Rare Plants: number 14. To help reduce adverse impacts to breeding sharp-tailed grouse and their display grounds, prohibit construction of new facilities within 0.25 miles of active display grounds. A display ground is no longer considered active if it is known to have been unoccupied during the current or most recent breeding season. This does not apply to pipelines, fences, windmills, and underground utilities. **Standard**
- F. Fish, Wildlife, and Rare Plants: number 15. To help reduce disturbances to breeding and nesting sharp-tailed grouse, do not authorize the following activities within 1.0 mile of active display grounds from March 1 to June 15:

- Construction (e.g., roads, water impoundments, pipelines, utilities, oil and gas facilities, fencing),
- Reclamation,
- Gravel mining operations,
- Seismic exploration,

- Oil and gas drilling,
- Drilling of water wells,
- Permitted recreation events,
- Training of hunting dogs. **Guideline**
  - ➢ F. Fish, Wildlife, and Rare Plants: number 18. In prairie dog colonies known or thought to be occupied by black-footed ferrets, limit oil and gas development to one location per 80 acres to help maintain suitable ferret habitat. **Standard**
  - ➢ F. Fish, Wildlife, and Rare Plants: number 19. To help provide suitable habitat for black-footed ferrets and their young during the breeding and whelping seasons, prohibit the following activities within prairie dog colonies, or those portions of larger colonies, occupied or thought to be occupied by black-footed ferrets from March 1 through August 31:
- Construction (for example, roads, water impoundments, oil and gas facilities),
- Reclamation,
- Gravel mining operations,
- Drilling of water wells,
- Oil and gas drilling. **Standard**
  - ➢ F. Fish, Wildlife, and Rare Plants: number 21. Any net loss of suitable black-footed ferret habitat as a result of prairie dog poisoning or development of new facilities within colonies must be replaced with suitable ferret habitat. This is based on the amount of suitable habitat available when the poisoning or development is proposed to occur. **Standard**
  - ➢ F. Fish, Wildlife, and Rare Plants: number 22. For routine maintenance, access to oil and gas facilities in prairie dog colonies occupied or thought to be occupied by black-footed ferrets should be limited to daylight hours. This does not apply to emergency repairs. **Guideline**
  - ➢ F. Fish, Wildlife, and Rare Plants: number 25. To help maintain suitable nesting habitat for mountain plover, prohibit development of new facilities within 0.25 miles of known mountain plover nests or nesting areas. This does not apply to pipelines, fences, and underground utilities. **Standard**
  - ➢ F. Fish, Wildlife, and Rare Plants: number 26. To help maintain occupied nesting and brooding habitat on black-tailed prairie dog colonies, new oil and gas development will be limited to one well per 80 acres within occupied habitat. Cumulatively, structure and facility development will not occur on more than 2 percent of the occupied mountain plover nesting habitat in each prairie dog colony. **Standard**
  - ➢ F. Fish, Wildlife, and Rare Plants: number 27. Any net loss of suitable and occupied mountain plover habitat as a result of prairie dog poisoning or development of new facilities within prairie dog colonies will be replaced within the year by concurrent expansion of suitable plover habitat or, in some cases, by enhanced management and protection of occupied plover habitat elsewhere on or near the national grassland. The amount of habitat loss is based on the amount of suitable and occupied habitat available prior to prairie dog dispersal in the year of the poisoning or development. **Guideline**
  - ➢ F. Fish, Wildlife, and Rare Plants: number 28. To help reduce disturbances and risks to nesting mountain plover, prohibit the following activities in plover nesting areas or within 0.25 miles of plover nests from March 15 through July 31:
- Construction (for example, roads, water impoundments, oil and gas facilities),

- Reclamation,
- Seismic exploration,
- Gravel mining operations,
- Oil and gas drilling,
- Drilling of water wells
- Prescribed burning. **Standard**

  - F. Fish, Wildlife, and Rare Plants: number 29. To help reduce disturbances and risks to nesting mountain plover, do not authorize the following activities in plover nesting areas or within 0.25 miles of plover nests from March 15 through July 31:

- Construction (e.g., pipelines, utilities, fencing),
- Workover operations for maintenance of oil and gas wells,
- Permitted recreation events involving large groups of people,
- Grasshopper spraying,
- Prairie dog shooting (in consultation with state wildlife agencies and U.S. Fish and Wildlife Service). **Guideline**

  - F. Fish, Wildlife, and Rare Plants: number 30. To help reduce risks to mountain plover, access to oil and gas facilities in occupied mountain plover habitat for routine maintenance should be limited to once per 24-hour period and occur between 9 a.m. and 5 p.m. Duration of maintenance activities should not extend beyond 1 hour when possible. This does not apply to travel for emergency repairs. **Guideline**
  - F. Fish, Wildlife, and Rare Plants: number 46. To help reduce adverse impacts to breeding sage grouse and their display grounds, prohibit construction of new oil and gas facilities within 0.25 miles of active display grounds. A display ground is no longer considered active if it is known to have been unoccupied during the past five breeding seasons. This does not apply to pipelines and underground utilities. **Standard**
  - F. Fish, Wildlife, and Rare Plants: number 47. To help reduce disturbances to nesting sage grouse, prohibit the following activities within 2.0 miles of active display grounds from March 1 to June 15:

- Construction (for example, roads, water impoundments, oil and gas facilities),
- Reclamation,
- Gravel mining operations,
- Drilling of water wells,
- Oil and gas drilling,
- Training of hunting dogs. **Standard**

  - F. Fish, Wildlife, and Rare Plants: number 48. To reduce disturbances to nesting sage grouse, do not authorize the following activities within 2.0 miles of active display grounds from March 1 to June 15:

- Construction (e.g., pipelines, utilities, fencing),
- Seismic exploration,

- Workover operations for maintenance of oil and gas wells,
- Permitted recreation events involving large groups of people. **Guideline**

  - F. Fish, Wildlife, and Rare Plants: number 49. To help prevent reproductive failure, limit noise on sage grouse display grounds from nearby facilities and activities to 49 decibels (10 dBA above background noise) from March 1 to June 15. **Guideline**
  - F. Fish, Wildlife, and Rare Plants: number 51. When constructing facilities or structures within 2 miles of a sage grouse active display ground, design them to discourage raptor perching by maintaining a low profile or using perch inhibitors. **Guideline**
  - F. Fish, Wildlife, and Rare Plants: number 52. Prohibit development or operations of facilities within 2 miles of a sage grouse display ground if these activities would exceed a noise level of more than 10 decibels above the background noise level (39 db), at 800 feet from the noise source, from March 1 to June 15. **Guideline**.
  - F. Fish, Wildlife, and Rare Plants: number 69. To reduce risks and habitat loss for prairie dogs and other wildlife species closely associated with prairie dog colonies, align new roads outside prairie dog colonies. If it is necessary to place a new road in a prairie dog colony, minimize the amount of road within the colony to the extent that soil, drainage, topographical, and other physical factors will allow. **Guideline**
  - F. Fish, Wildlife, and Rare Plants: number 70. To reduce disturbances to swift fox during the breeding and whelping seasons, prohibit the following activities within 0.25 miles of their dens from March 1 to August 31:

- Construction (e.g., roads, water impoundments, oil and gas facilities),
- Reclamation,
- Gravel mining operations,
- Drilling of water wells,
- Oil and gas drilling. **Standard**

  - F. Fish, Wildlife, and Rare Plants: number 71. To reduce disturbances to swift fox during the breeding and whelping seasons, do not authorize the following activities within 0.25 miles of their dens from March 1 to August 31:

- Construction (e.g., pipelines, utilities, fencing),
- Seismic exploration,
- Workover operations for maintenance of oil and gas wells,
- Permitted recreation events involving large groups of people. **Guideline**

  - F. Fish, Wildlife, and Rare Plants: number 76. To help prevent abandonment, reproductive failure or nest destruction, prohibit development of new facilities within the minimum distances (line of sight) of active raptor nests and winter roost sites as specified in the following table. For the bald eagle, golden eagle, merlin, ferruginous hawk, and Swainson's hawk, a nest is no longer considered active if it is known to have been unoccupied for the last 7 years. For the burrowing owl and other raptor species, a nest is no longer considered active if it is known to have been unoccupied during the current or most recent nesting season. This does not apply to pipelines, fences, and underground utilities. **Standard**

Species and Habitat	Minimum Distance (miles)
Bald eagle nest	1.0
Bald eagle winter roost area	1.0
Golden eagle nest	0.25
Merlin nest	0.25
Ferruginous hawk nest	0.25
Swainson's hawk nest	0.25
Burrowing owl nest	0.25
Nests of other raptors	0.125

➢ F. Fish, Wildlife, and Rare Plants: number 77. To help reduce disturbances to nesting and wintering raptors, prohibit the following activities within the minimum distances (line of sight) of active raptor nests and winter roost areas during the dates specified in the table below:

- Construction (e.g., roads, water impoundments, oil and gas facilities),
- Reclamation,
- Gravel mining operations,
- Drilling of water wells,
- Oil and gas drilling,
- Timber harvest and fuel treatments
- Pre-commercial thinning. **Standard**

Species and Habitat	Minimum Distance (miles) and Dates
Bald eagle nest	1.0 from 2/1 to 7/31
Bald eagle winter roost area	1.0 from 11/1 to 3/31
Golden eagle nest	0.50 from 2/1 to 7/31
Merlin nest	0.50 from 4/1 to 8/15
Ferruginous hawk nest	0.50 from 3/1 to 7/31
Swainson's hawk nest	0.50 from 3/1 to 7/31
Burrowing owl nest	0.25 from 4/15 to 8/31
Nests of other raptors	0.125 from 2/1 to 7/31[a]

Note:
a. Dates may vary depending on the species

➢ F. Fish, Wildlife, and Rare Plants: number 78. To help reduce disturbances to nesting and wintering raptors, do not authorize the following activities within the minimum distances (line of sight) of active raptor nests and winter roost areas during the dates specified in the previous table:

- Construction (e.g., pipelines, utilities, fencing),

- Seismic exploration,
- Workover operations for maintenance of oil and gas,
- Fuelwood cutting,
- Permitted recreation events involving large groups of people. **Guideline**

  - L. Scenery Management: number 1. Manage activities to be consistent with the scenic integrity objective(s), as referenced by the Adopted Scenic Integrity Objective map in Chapter 2. **Guideline**

Management Area Standards and Guidelines, which resulted in oil and gas leasing stipulations, are as follows:

- Management Area 3.68, Big Game, General number 2. Limit activities during big game wintering from December 15 through March 15 if they would reduce habitat effectiveness. **Guideline**
- Management Area 3.68, Big Game, General number 3. Limit activities during elk parturition from May 1 through June 30 if they would reduce habitat effectiveness. **Guideline**

Conclusion for TBNG LRMP: Based on careful review of Chapter 4 relative to the current LRMP goals and objectives for the TBNG, the Forest Service has determined that within the analyzed level of oil and gas development, resource management objectives for the TBNG LRMP will be achieved. Unique aspects of CBM will be adequately mitigated using COA and existing lease stipulations, lease notices, and current land use allocations in the Revised TBNG LRMP. Therefore, there is no need to modify or add any Standards and Guidelines to the 2002 Revised TBNG LRMP in order to implement the Preferred Alternative.

Appendix R

Designations of ACECs Proposed by the Sierra Club of Wyoming for Areas in the Buffalo Field Office Area

Appendix R — Preliminary Multi-resource Staff Analysis of ACEC Proposed Designations from the Sierra Club of Wyoming for Several Areas in the Buffalo Field Office (BFO), September 2002

The Sierra Club of Wyoming has petitioned the BFO to nominate the following areas for designation as outlined in the Bureau's 1617.8 Manual guidelines for Designation of Areas of Critical Environmental Concern, (ACEC). The areas are:

- Pumpkin Buttes
- Dry Creek Petrified Tree
- Hell's Half Acre
- Fortification Creek Elk Area
- Cantonment Reno
- Face of the Bighorns
- Hole-In-The-Wall

The BFO also must evaluate any newly acquired lands for ACEC if they meet the criteria. The Cow Creek Breaks is an area acquired in 2001 through exchange that was evaluated.

Before an area is nominated for ACEC designation the area must meet both the relevance and importance criteria (43 CFR 1610.7–2) and BLM Manual 1613, to become eligible for further consideration. Relevance and importance are defined as follows:

(1) Relevance: Where special management potential is required to protect and prevent irreparable damage to important historic, cultural or scenic values, fish and wildlife resources or other natural systems or processes or to protect life and safety from natural hazards.

(2) Importance: A resource is important if it has qualities that give it special worth, meaning, distinctiveness, or cause for concern, especially when compared to any like or similar resources. It also must be more-than- logically significant. Qualities or circumstances that make such a resource fragile, sensitive, rare, irreplaceable, endangered, threatened or vulnerable to adverse change may be among the reasons management action is appropriate.

An Area meets the "relevance" criterion if it contains one or more of the following:

1. A significant historic, cultural, or scenic value (including but not limited to rare or sensitive archeological resources and religious or cultural resources important to Native Americans).

2. A fish and wildlife resource (including but not limited to endangered, sensitive or threatened species or habitat essential for maintaining species diversity).
3. A natural process or systems (including but limited to habitat for endangered, sensitive or threatened plant species: rare plant or plant communities; or rare geologic features).
4. Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity or dangerous cliffs). A hazard caused by human action may meet the relevance criteria if it is determined through the resource management planning process that it has become part of a natural process.

An area meets the "importance" criterion if it further meets one or more of the following:

1. Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.
2. Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.
3. Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA.
4. Has qualities which warrant highlighting in order to satisfy public or management concerns about safety and public welfare.
5. Poses a significant threat to human life and safety or to property.

Table R–1 shows the areas that have been identified based on comments received and internal interdisciplinary staff analysis. The BLM relevance and importance determinations are also listed.

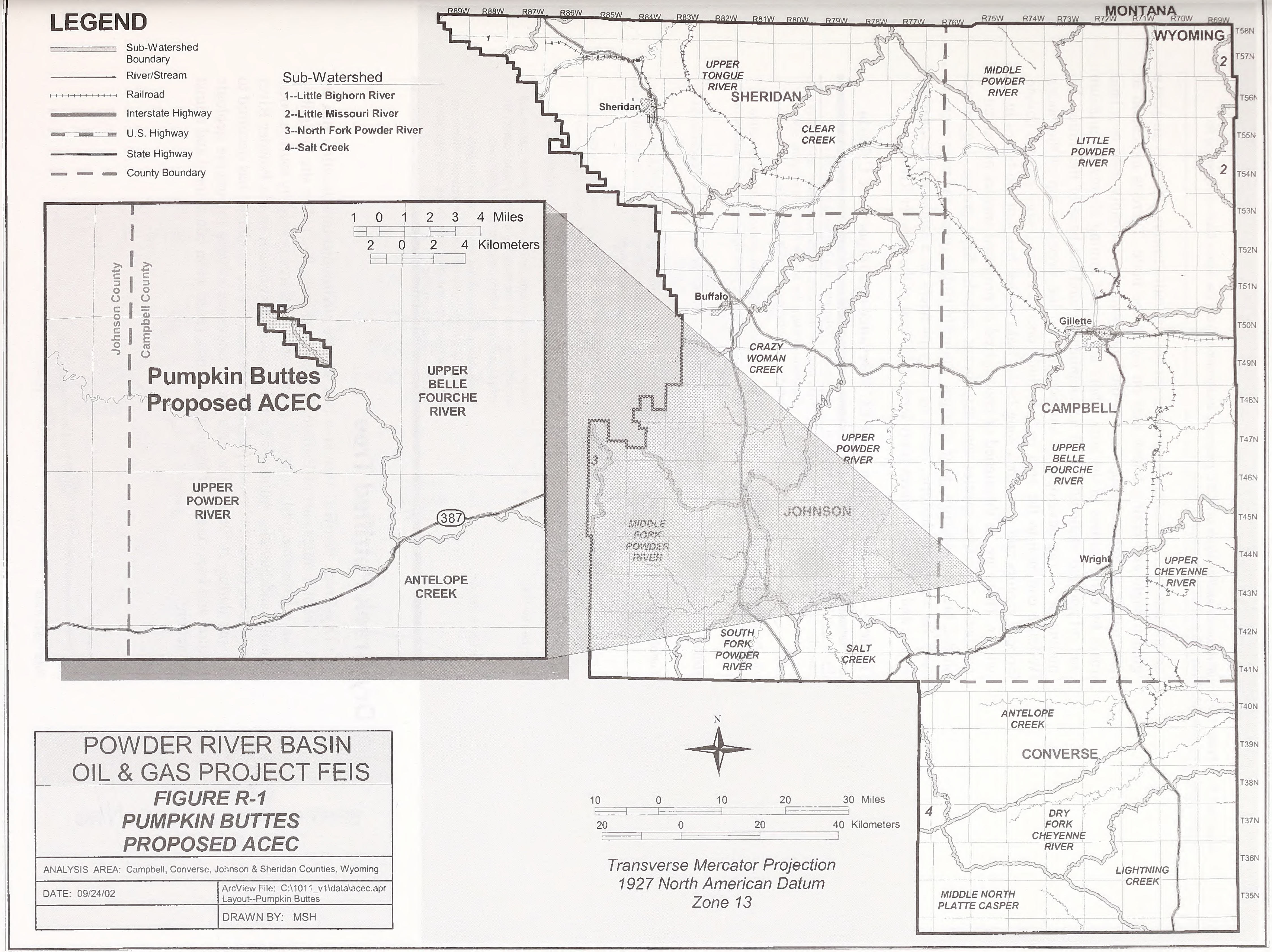
Of the eight areas reviewed, the BLM administered lands on three areas were found to not meet the criteria and were dropped from further consideration. The BLM administered lands on 5 proposed ACECs were found to meet the criteria and were retained for further consideration.

ACEC Analysis for the Buffalo Field Office

The following is a narrative description of proposed ACEC areas in the Buffalo Field Office.

Pumpkin Buttes

The north and south Middle Butte are the only portion of the Pumpkin Buttes in Federal ownership. The buttes are located approximately 45 miles southwest of Gillette, Wyoming (Figure R–1). The butte rises about 800 feet from the surrounding landscape and are the only significant geologic uplift for several miles. There is no public access to the Middle Buttes. The south middle butte is used as



Transverse Mercator Projection
1927 North American Datum
Zone 13

POWDER RIVER BASIN
OIL & GAS PROJECT FEIS

FIGURE R-1
PUMPKIN BUTTES
PROPOSED ACEC

ANALYSIS AREA: Campbell, Converse, Johnson & Sheridan Counties, Wyoming

DATE: 09/24/02	ArcView File: C:\1011_v1\data\acec.apr Layout--Pumpkin Buttes
	DRAWN BY: MSH

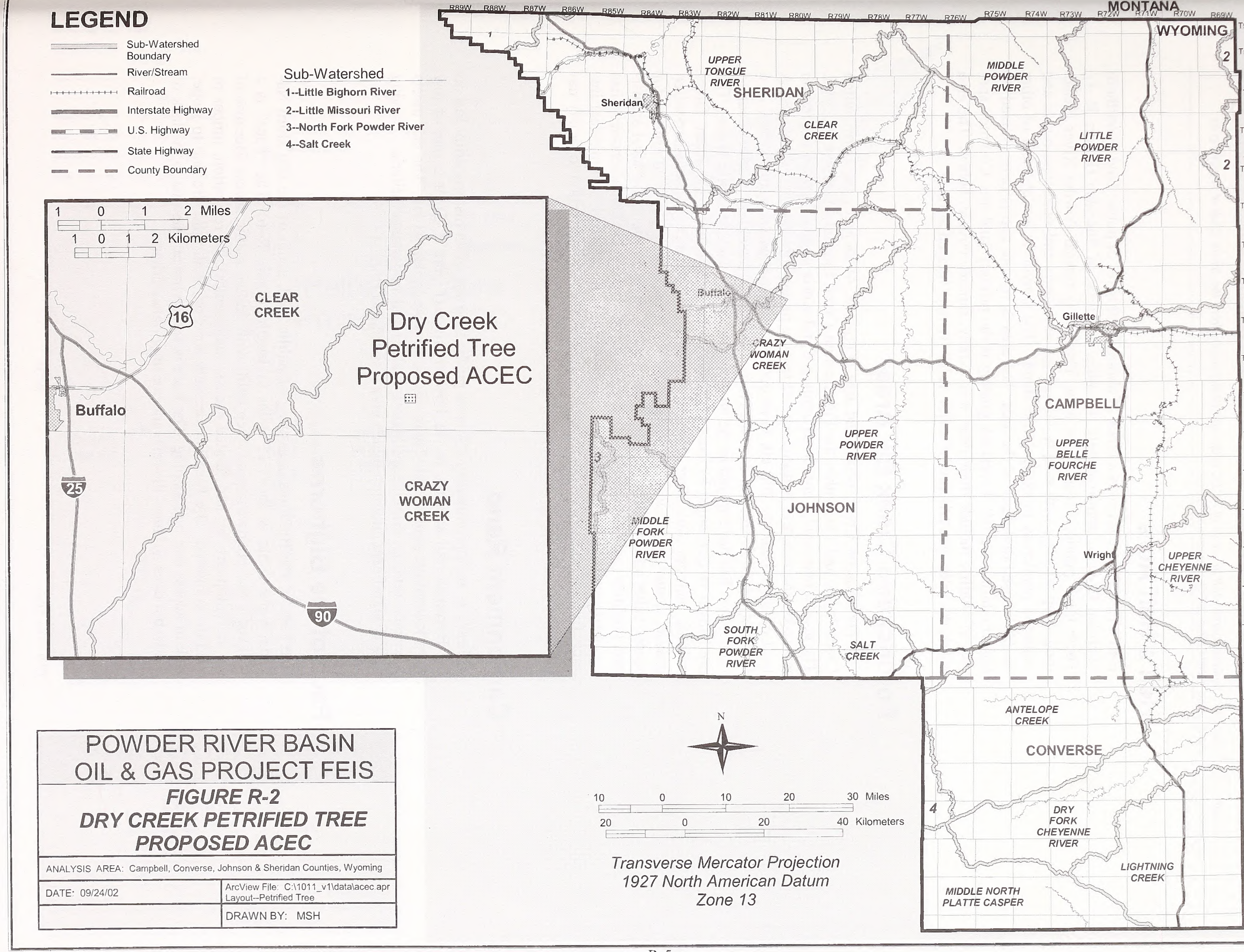
an administrative communication site for several radio towers. There is an active golden eagle and prairie falcon nest on top of the butte. There is indication of past native American occupation on the butte, and was probably used as a land mark by early settlers in the area. There are several mining claims for uranium and oil and gas exploration and development around the base of the buttes. No mining or energy development has occurred on the slopes or top of the buttes. Wildlife common to the area include mule deer, antelope, sage grouse, coyote, bobcat, raptors and numerous song birds. Bald eagles frequent the buttes in the winter. There are no threatened or endangered or proposed species or habitat on the butte. Sensitive species that may occur include: Sage grouse, loggerhead shrike, brewer's sparrow, sage sparrow. Pumpkin Buttes meets the relevance criteria for important historic, (used by early pioneers as a landmark destination) scenic and geologic features (only large uplift east of the Powder River).

Table R–1 Evaluation of ACEC Relevance and Importance Criteria

Existing or Proposed ACECs	Recommended	Comments (Relevance and Importance Criteria)
Pumpkin Buttes	Yes	May meet the relevance criteria for cultural values. May meet importance criteria for Native American religious sites pending consultation with affected tribes.
Dry Creek Petrified Tree	Yes	Meets relevance criteria for geologic features as well as importance criteria for local significance and qualities that are rare.
Hell's Half Acre	No	Meets relevance criteria for scenic values but does not meet importance criteria.
Fortification Creek Area	Yes	Meets relevance criteria for scenic and wildlife resources as well as importance criteria for local significance, and national concerns, and fragile watershed
Cantonment Reno	Yes	Meets relevance criteria for historic values as well as importance criteria for local and national significance.
Face of the Bighorns	No	Does not meet relevance or importance criteria.
Hole-In-The-Wall	Yes	Meets relevance criteria for cultural and scenic values and importance criteria for local and national significance, are unique, and have public concerns for management.
Cow Creek Breaks	Yes	Meets relevance criteria for scenic, important geologic features and fragile watershed and importance criteria for local qualities; national priority concerns; and have public concerns for management

Dry Creek Petrified Tree

The Dry Creek Petrified Tree area is a 40-acre environmental education site, located about 8 miles east of Buffalo, Wyoming (Figure R–2). The site has public access, interpretive trail, outhouse, picnic table. The area is used by tourists, local schools, and hunters. Although Petrified wood is common in the Powder River breaks area, there are limited public access sites. Little vandalism has occurred to the site during 20 years. The area meets relevance criteria for unique geologic feature, and importance for local significance, (used as an educational and tourist attraction).



POWDER RIVER BASIN
OIL & GAS PROJECT FEIS

FIGURE R-2
DRY CREEK PETRIFIED TREE
PROPOSED ACEC

ANALYSIS AREA: Campbell, Converse, Johnson & Sheridan Counties, Wyoming

DATE: 09/24/02	ArcView File: C:\1011_v1\data\acec.apr Layout--Petrified Tree
	DRAWN BY: MSH

Hell's Half Acre

Hell's Half Acre canyon is a block of about 1,900 acres of public land in northern Sheridan County, approximately 46 miles northeast of Sheridan (Figure R–3). There is no public access to the area. The site is typical Powder River breaks rough, topography, with steeply incised gullies, scoria and sandstone buttes and scattered ponderosa pine/sagebrush stands. The canyon is not atypical of other deeply incised drainages in the area. The area is remote and is only utilized by hunters during the fall. Livestock grazing is the primary land use. Common species of wildlife include mule deer, wild turkey, raptors, coyote, bobcat. The area meets the relevance criteria for scenic value (remote incised terrain).

Fortification Creek Elk Area

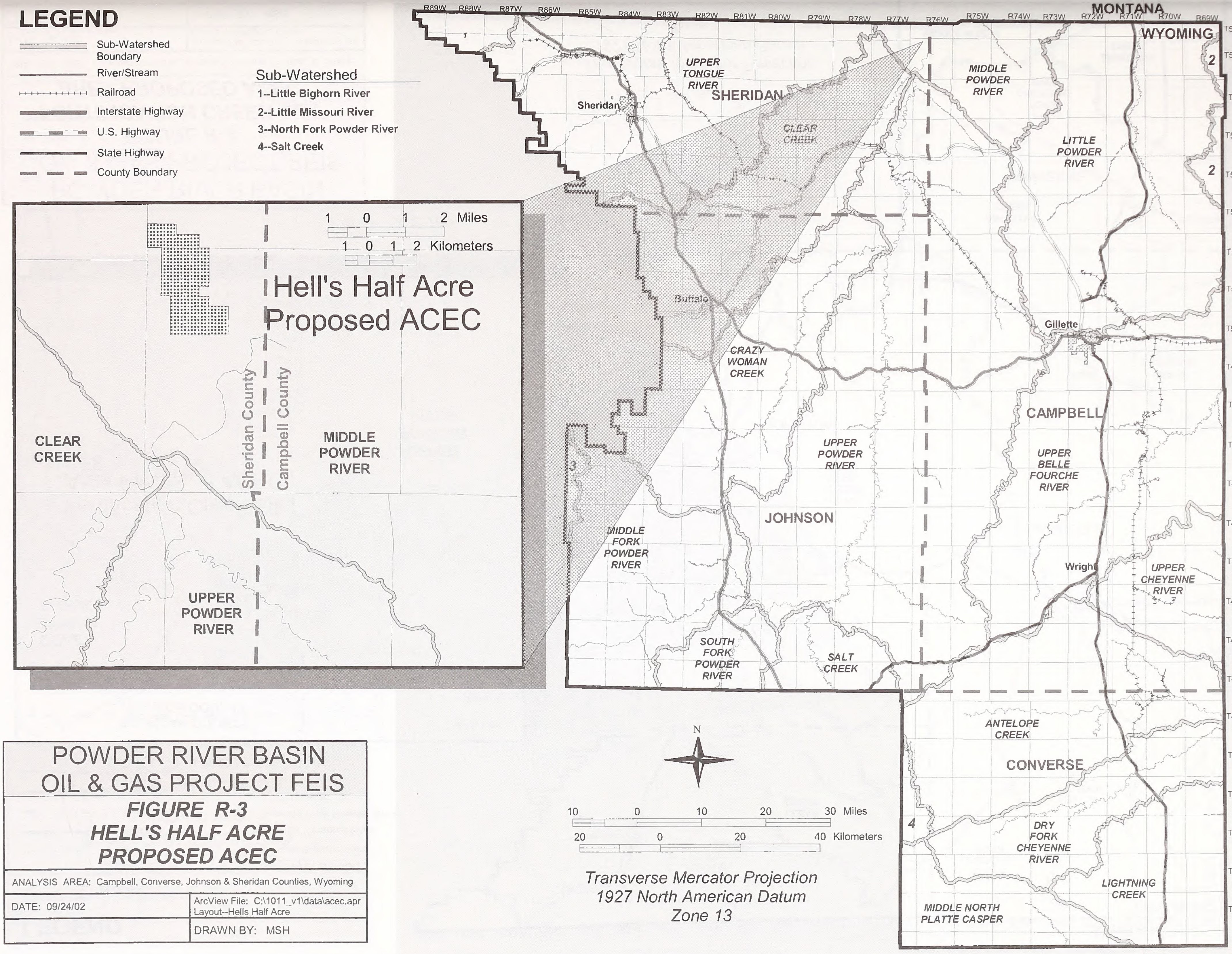
The Fortification Creek nominated area (Figure R–4) includes the Fortification Creek WSA and lies within the Fortification Creek Special Management Area. The area is bisected by numerous drainages and scoria uplifts. Typical vegetation is sagebrush/grassland bottoms with extensive juniper uplands and drainages. A herd of approximately 200 elk have occurred in the area since the 1950s, as a result of releases from Yellowstone National Park. Elk have historically occurred in the area. Elk have stayed in the area because of the lack of public access. The elk habitat is threatened by encroaching coal bed methane development. Other wildlife includes mule deer, antelope, coyote, bobcat, sage grouse, sharp-tailed grouse, raptors and numerous songbirds. The area meets relevance criteria for scenic value and wildlife. It also meets the importance criteria for local significant qualities (only area in Campbell County with wilderness characteristics); has circumstances that make it fragile, and unique (plains elk herd, and minimal impacts from man); and has been recognized as warranting protection to satisfy national priority concerns.

Cantonment Reno

This site is an approximately 480 acre public land site of an historic army fort on the Bozeman trail adjacent to the Powder River (Figure R–5). It is one of few forts located on public land. There are no historic buildings left. The site meets relevance criteria, (significant historic value) and importance criteria , (having locally significant qualities, which give it special worth).

Face of the Bighorns

The Face of the Bighorns is a string of public land, south of the Big Horn National Forest, that is about 15 miles in length (Figure R–6). The "Face" is a lodgepole and ponderosa pine steep uplift with limited public access. Because of the steep topography and limited access, management for recreation, timber or wildlife is limited. The Face is extremely susceptible to wild fire due to slope, lack of access and fuel loading. The Face is somewhat unique due to the lack of roads, but does not meet the relevance or importance criteria.



POWDER RIVER BASIN
OIL & GAS PROJECT FEIS

FIGURE R-3
HELL'S HALF ACRE
PROPOSED ACEC

ANALYSIS AREA: Campbell, Converse, Johnson & Sheridan Counties, Wyoming

DATE: 09/24/02	ArcView File: C:\1011_v1\data\acec.apr Layout--Hells Half Acre
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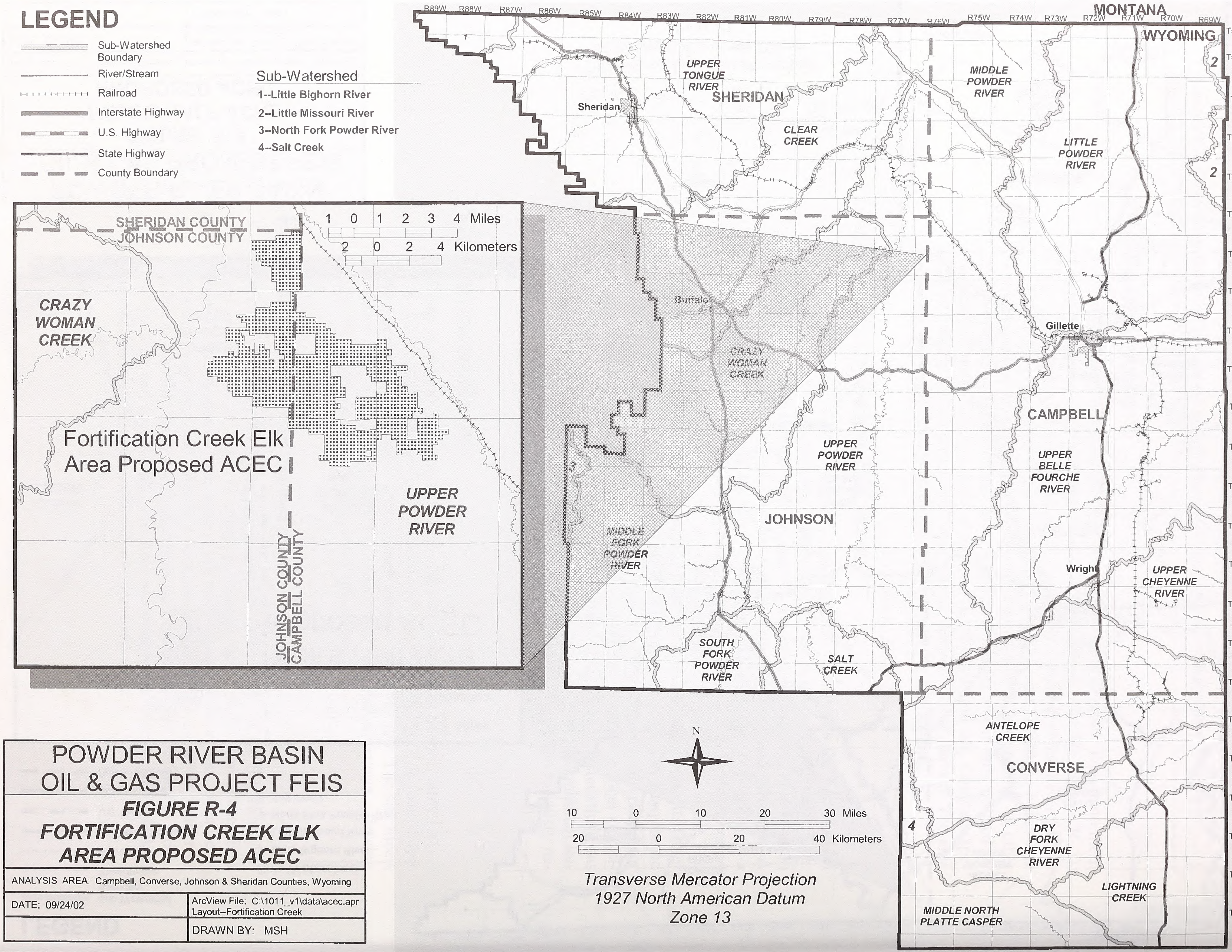

POWDER RIVER BASIN OIL & GAS PROJECT FEIS

FIGURE R-4

FORTIFICATION CREEK ELK AREA PROPOSED ACEC

ANALYSIS AREA: Campbell, Converse, Johnson & Sheridan Counties, Wyoming

DATE: 09/24/02

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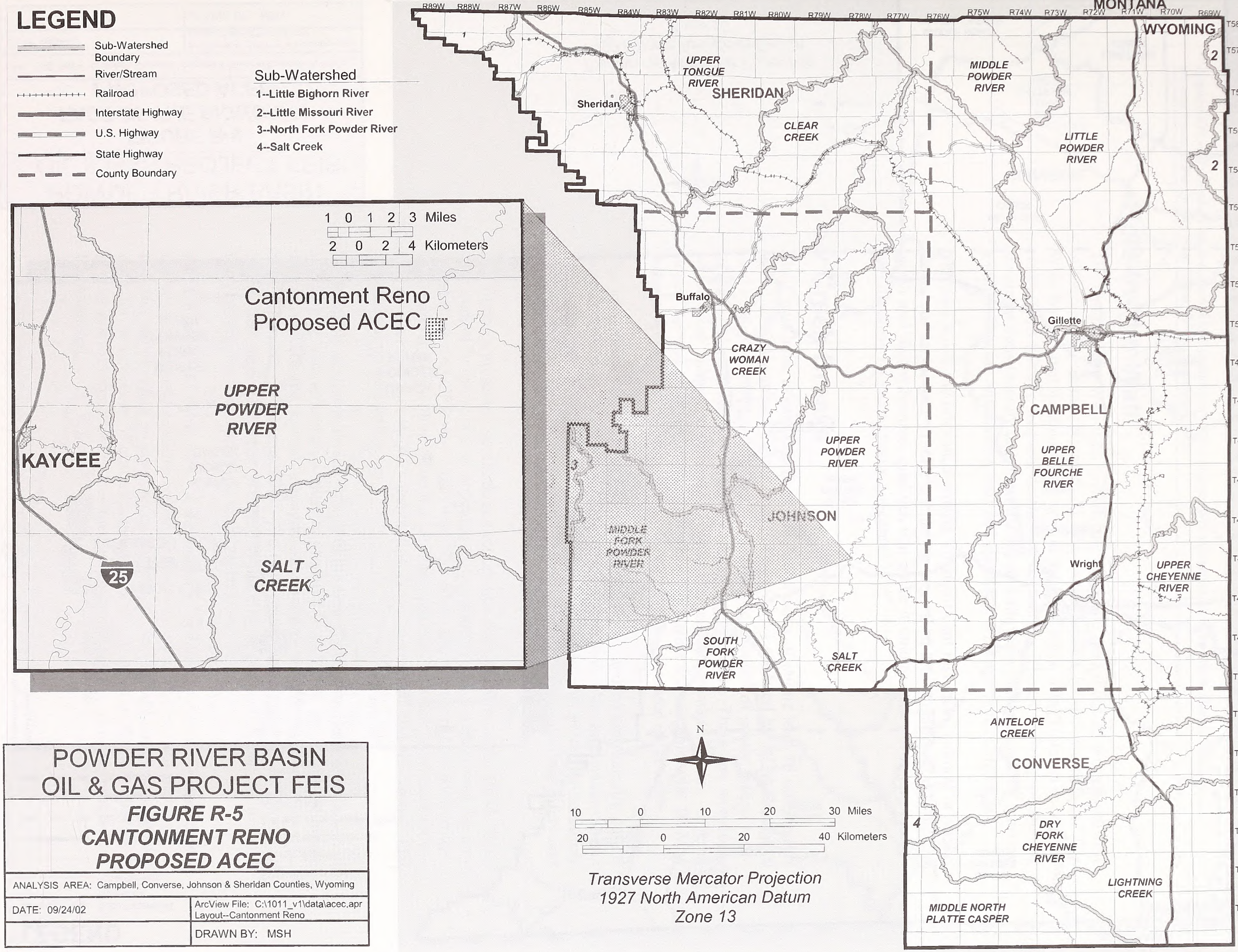
Layout--Fortification Creek

DRAWN BY: MSH

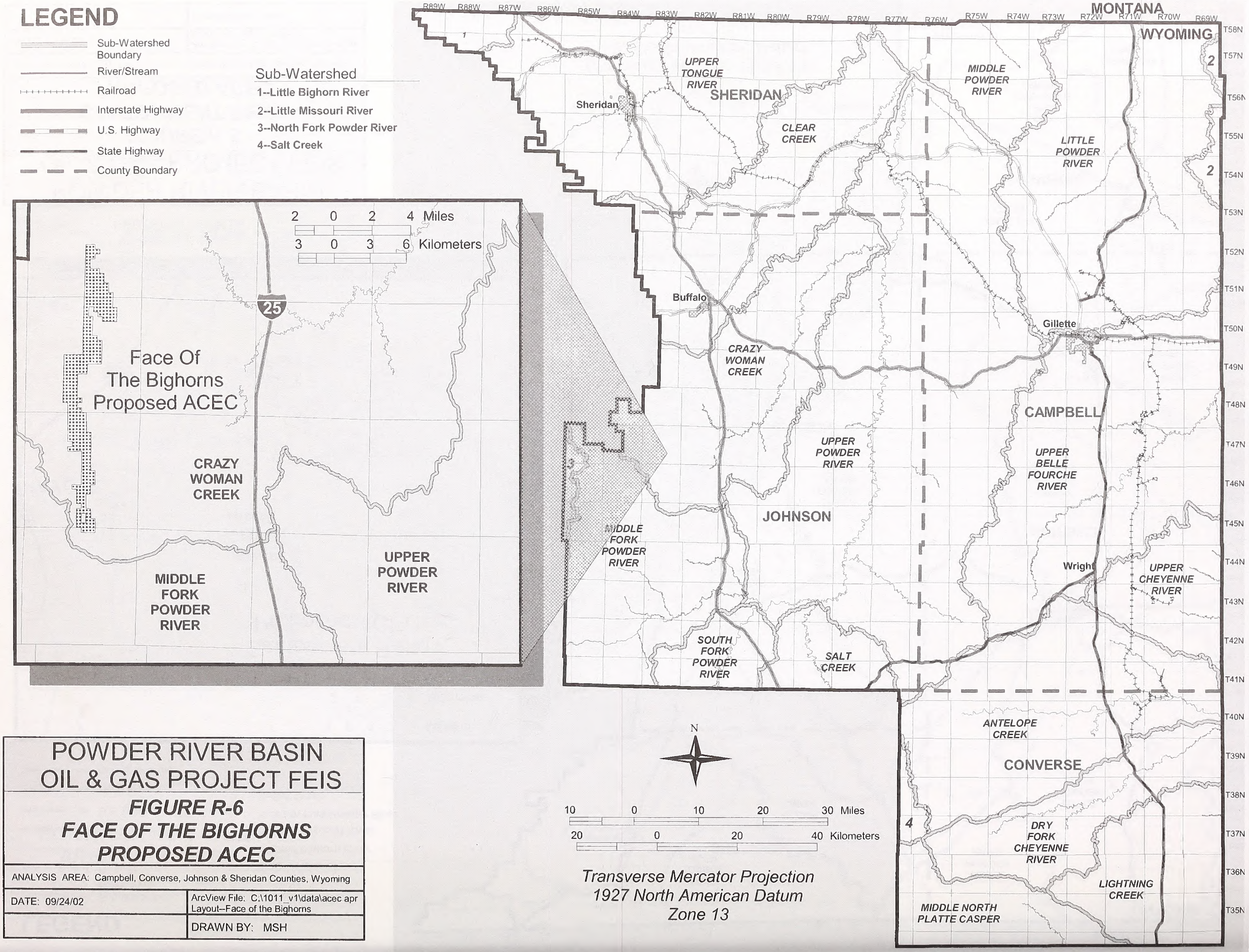


POWDER RIVER BASIN
OIL & GAS PROJECT FEIS

FIGURE R-5
CANTONMENT RENO
PROPOSED ACEC

ANALYSIS AREA: Campbell, Converse, Johnson & Sheridan Counties, Wyoming

DATE: 09/24/02
ArcView File: C:\1011_v1\data\acec.apr
Layout--Cantonment Reno
DRAWN BY: MSH



POWDER RIVER BASIN
OIL & GAS PROJECT FEIS

FIGURE R-6
FACE OF THE BIGHORNS PROPOSED ACEC

ANALYSIS AREA: Campbell, Converse, Johnson & Sheridan Counties, Wyoming

DATE: 09/24/02

ArcView File: C:\1011_v1\data\acec.apr
Layout--Face of the Bighorns

DRAWN BY: MSH

Hole-In-The-Wall

The Hole-In-The-Wall is an historic site on public land about 20 miles southwest of Kaycee, Wyoming (Figure R–7). The area is famous for outlaws such as "The Wild Bunch" that frequented the area in the late 1800's. The "Hole" is scenic red rocks uplift that is a frequent destination for tourists. The BLM has implemented several actions recently to protect the site and allow for public access, by creating a public viewing and parking area and trail head, with interpretive signing.

The area meets the relevance criteria for significant historical, cultural or scenic value, and importance criteria for having more than local significant qualities of worth and distinctiveness; qualities that make it unique; and warranting protection to satisfy national priority concerns.

Cow Creek Breaks

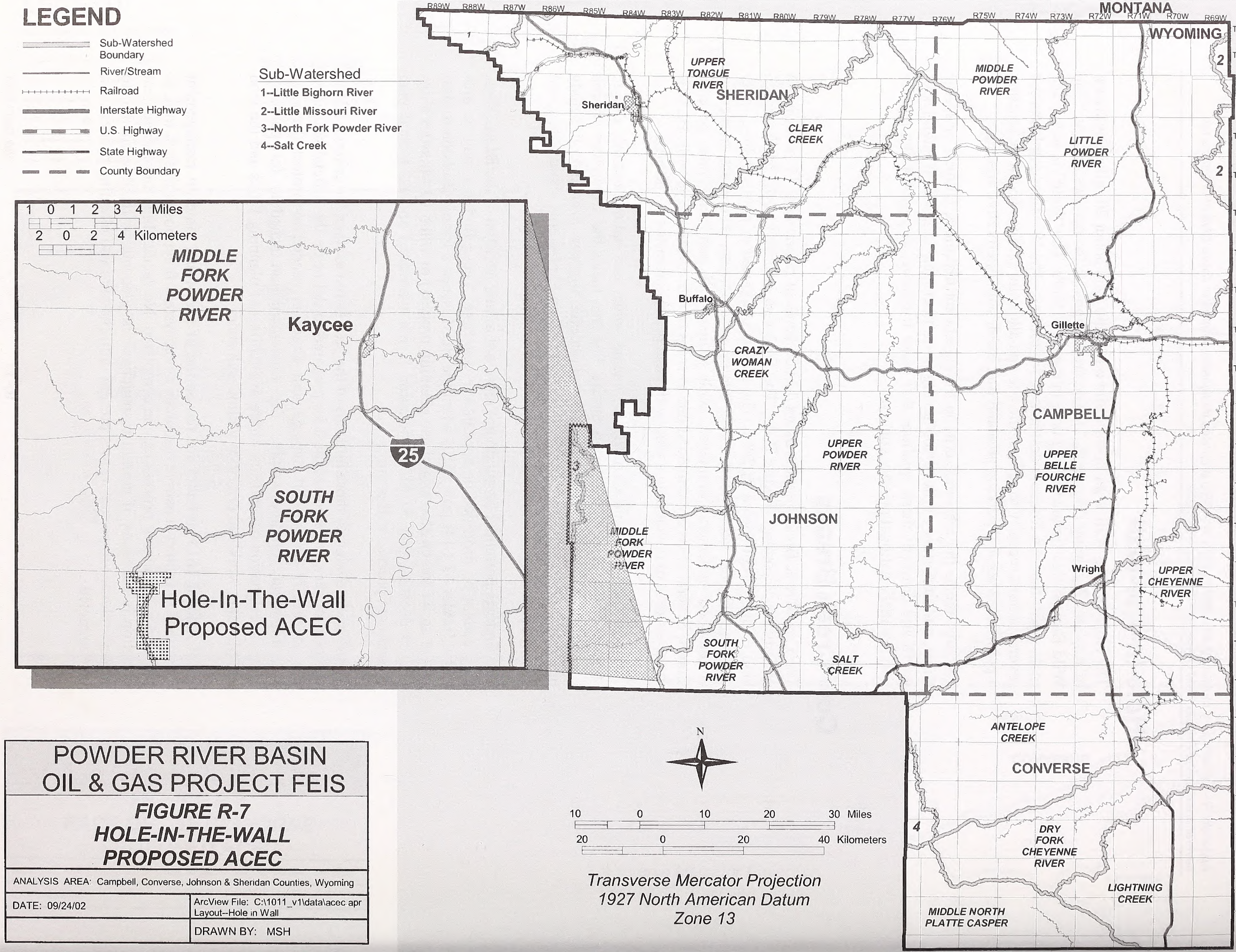
The Cow Creek Breaks entails about 17,000 acres of public land 15 miles north of Gillette, Wyoming (Figure R–8). The land was acquired by BLM through a land exchange completed in 2001. The area is composed of gently rolling sagebrush/grasslands, scoria buttes and clayey escarpments. There are numerous cottonwood ephemeral drainages, with juniper and ponderosa pine covered slopes. Several areas are unroaded due to steep terrain and unstable soils. BLM is in the process of developing a plan with local goups interested in the area.

The area meets relevance criteria for scenic value, and natural hazards due to steep erosive soils and flooding potential. The area meets the importance criteria for local significant qualities (recreational access); warrants protection to satisfy national priority concerns; and public or management concerns about safety and property.

The findings presented herein do not represent a final decision of the BLM. Thus, they cannot be protested or appealed at this time. These findings may be protested (under 43 CFR part 1610) when the BLM issues a formal decision to designate an ACEC (within a land use planning process) or when BLM issues a notice or decision that ACEC designation is not warranted and no formal plan amendment process will occur.

To officially designate those portions of the area found to meet the criteria, a land use plan or plan amendment must be prepared to delineate the official boundary and to specify the special management direction needed to protect the relevant/important resource values. The implementation schedule for pursuing ACEC designation depends on future availability of planning funds and the land use planning workload priorities within each state.

BLM manual 1613 provides for the option of specifying "interim management direction" to protect sensitive resources or ecosystem functions until such time as the land use planning process can be completed. No special Interim management direction is necessary if current management is adequate or flexible enough to protect relevant/important values present until the land use planning process can be completed.

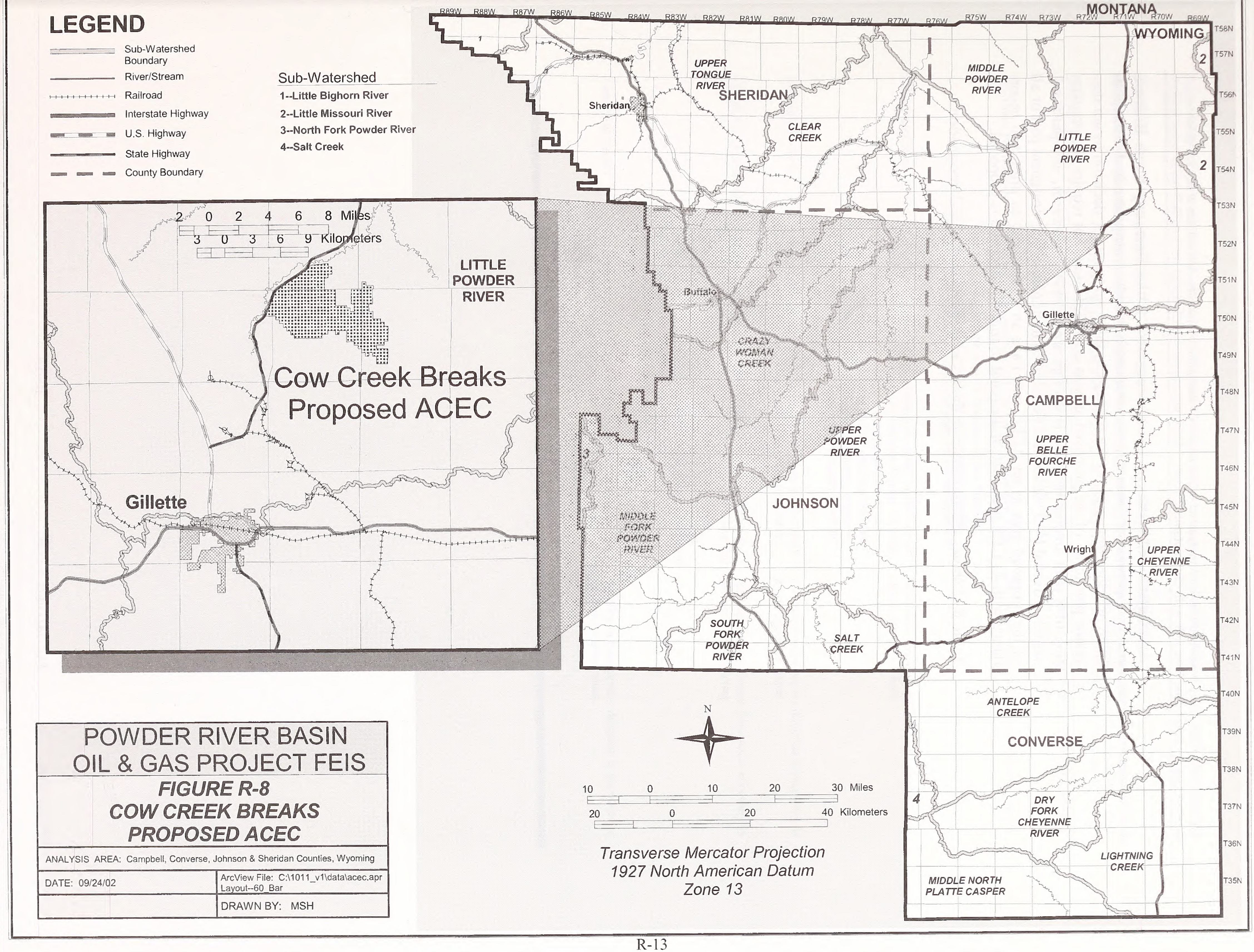


POWDER RIVER BASIN
OIL & GAS PROJECT FEIS

FIGURE R-7
HOLE-IN-THE-WALL
PROPOSED ACEC

ANALYSIS AREA: Campbell, Converse, Johnson & Sheridan Counties, Wyoming

DATE: 09/24/02	ArcView File: C:\1011_v1\data\acec apr Layout--Hole in Wall
	DRAWN BY: MSH



POWDER RIVER BASIN
OIL & GAS PROJECT FEIS

FIGURE R-8
COW CREEK BREAKS
PROPOSED ACEC

ANALYSIS AREA: Campbell, Converse, Johnson & Sheridan Counties, Wyoming

DATE: 09/24/02	ArcView File: C:\1011_v1\data\acec.apr Layout--60_Bar
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Although formal comments are not requested at this time, any future land use planning process addressing these areas will provide an opportunity for the public to provide comments on the findings in this evaluation. A decision to not designate part or all of the proposed area as an ACEC does not require the preparation of a plan amendment and is exempt from NEPA. However, any party adversely affected by a subsequent decision to designate or not designate part or all of the proposed area as an ACEC will have an opportunity to protest in accordance with 43 CFR part 1610 at the point in time the decision is proposed.

Table R–2 shows the known or no threats to the proposed ACEC designation.

Table R–2 Proposed ACEC Determination of Powder River Basin EIS

Proposed ACEC	Current Mitigation Related To Oil And Gas Development And Other Protection Measures In Place.	Interim Management Needed As A Result Of Affects From Development Proposed In The Powder River Basin Eis
Pumpkin Buttes	Proposed mitigation from the EIS, programmatic mitigation brought forward and standard conditions of approval can be applied at APD approval.	No interim management direction is necessary to protect resource values.
Dry Creek Petrified tree	Forty acre parcel designated as "No surface occupancy" from oil and gas activity. Area fenced to prevent impacts from grazing. Trail and outhouse limit impacts from recreation. Proposed mitigation from the EIS, programmatic mitigation brought forward and standard conditions of approval can be applied at APD approval. .	No interim management direction is necessary to protect resource values.
Cantonment Reno	"No surface occupancy from oil and gas activity on 480 acres. No public access to site prevents recreational overuse. Existing management adequate to protect relevant/important values present until the land use planning process can be completed. Proposed mitigation from the EIS, programmatic mitigation brought forward and standard conditions of approval can be applied at APD approval. .	No interim management direction is necessary to protect resource values.
Hole-In-The-Wall	Area outside of CBM development area. Protected with "NSO" designation. Developed hiking trail protects area from OHV impacts. Adequate grazing management direction.	No interim management direction is necessary to protect resource values.
Fortification Creek Area.	No oil and gas leasing is a part of the interim management for the WSA. The area outside of the WSA is leased with controlled surface use and timing limit stipulations for elk. Adequate measures exist to protect the value of the area from livestock grazing. Limited public access prevents OHV impacts. Proposed mitigation from the EIS, programmatic mitigation brought forward and standard conditions of approval can be applied at APD approval.	No interim management direction is necessary to protect resource values.
Cow Creek breaks	The area is outside of CBM development area. A coordinated activity plan is being developed to establish management objectives for the area. Proposed mitigation from the EIS, programmatic mitigation brought forward and standard conditions of approval can be applied at APD approval.	No interim management direction is necessary to protect resource values.

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